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VIEWS, NEWS AND INTERVIEWS.

At the recent annual meeting of the Institution of Electrical Engineers, in London, Mr. F. H. Webb retired from the secretaryship after 20 years of active and efficient service. The council awarded to him a retiring pension of $1,500 a year. Mr. Webb will hereafter act as honorary secretary of the institution.

The catacomb of St. Calixtus, at Rome, is now lighted by electricity, and it is asserted that the system will soon be extended to include all the catacombs.

An old telegraph operator in Texas bewails the advent of the typewriter and the decline of the chirography peculiar to the fraternity. "I have heard bankers in Houston state that they preferred an operator's handwriting, in money transactions, to typewritten telegrams," says the operator. "Many cotton men, in large transactions, prefer plain chirography to the typewriter. There is no loophole for a telegraph company to evade responsibility when a telegram is received by one of their operators with a pen. An official of the Western Union recently declared to me that no operator could swear he received a typewritten telegram, but when received by a pen he can not deny his own handwriting."

London business men were recently disturbed by the transfer of the stamp and telegraph offices of the general post office at St. Martin's le Grand, used for 25 years past, to a new building across the street.

In Hang-Chow-Foo, the capital of Che-Kiang, and in Han-Kow, on the Upper Yangtse, Chinese syndicates have been formed to erect electric lighting works, according to a London contemporary. Even in Chang-Sha, the capital of the province Hunan, which is noted for its bitter feeling against foreigners, electricity works have already been put in operation for the lighting of private houses.

The huge bivalve lens which was exhibited at the World's Fair by Henry Lepaute, of Paris, France, and was purchased for $10,000 by the Lighthouse Board, and has since been on exhibition at the expositions at Atlanta and Nashville, is now undergoing a 10 days' test at the general depot of the lighthouse establishment at Tompkinsville, S. I. If this exhaustive test is successful, says the New York *Sun*, the light will probably be installed at some point along the coast, though its exact location has not yet been decided upon. The lenses of this light are nine feet in diameter. Each is composed of a central disk, two prismatic rims and 190 prismatic segments of rims, all of carefully-ground optical glass. The prisms of each lens are mounted in a brass framework made in 19 sections. The light is furnished by a specially designed electric arc, and there are three lamps. Two of them are interchangeable by simply turning a hand wheel, and the third can easily be substituted for either. The lamps have interchangeable carbons of different sizes, so that the light can be varied in intensity according to the condition of the atmosphere. With carbons one inch in diameter, the light is equal to from 8,000 to 10,000 standard candles. Each lens gathers nearly a half of this light and projects it in a beam nine feet in diameter, which has an estimated intensity of 90,000,000 candles. The tests are being conducted under the supervision of Lieut.-Col. D. P. Heap, corps of engineers, U. S. A., engineer of the third lighthouse district, and C. A. Lamy, superintendent of the depot. One criticism so far made is on the use of mercury for the bearing. There are on the floor above the big light two smaller ones—one mounted in mercury and the other on a ball-bearing designed by Lieutenant Colonel Heap; and while the one in mercury, though it weighs only 300 pounds, moves no more easily than the 20-ton one below, a mere breath will revolve the one on ball-bearings.

What do you think of the change?

FIG. 1.—INTERIOR VIEW OF THE CHINESE TELEPHONE EXCHANGE IN SAN FRANCISCO.

THE CHINESE TELEPHONE EXCHANGE IN SAN FRANCISCO.

THE ONLY ONE OF THE KIND IN THE UNITED STATES.

There is but one Chinese telephone exchange in the United States. To the average American, who, at rare intervals, hears a conversation carried on between two citizens of the Celestial Empire, the idea that similar language might be used over a telephone line must appear to be out of the ordinary. The Chinaman is notorious for his temperance in all things, even to the use of language. His personal expenses are also reduced to a minimum, and unless he is a considerable personage among his fellow countrymen, and a man of wealth, he is not expected to do things of any sort in the American way.

However, when it is borne in mind that there are over 25,000 Chinese in San Francisco, it does not seem at all wonderful that among them should be a considerable number of business men who are obliged to patronize the telephone service. The Chinaman is, first of all, a merchant, and any aid to business which he can secure is recognized at its full value by him. In Fig. 1 is shown an interior view of the Chinese telephone exchange in San Francisco, with the operators and messenger boy in full view. This is a separate exchange of the Pacific Telephone and Telegraph Company, and is run entirely distinct from the company's main exchange. The switching between the Chinese subscribers is free, but if they wish to connect with the subscribers in the city proper, they are charged five cents per call. In Fig. 2 is shown a portion of the message blank which is sent to Chinese with whom some one desires to talk. The characters shown mean "Come to the telephone office quick." There are now 54 subscribers to this Chinese telephone exchange, and the Pacific Telephone and Telegraph Company expects to have several hundred more before the end of 1898.

The telephone is peculiarly serviceable to the Chinese, and they are

great patrons of the territorial lines throughout California. The reason for this is that they can talk directly to their fellow countrymen, and there is no necessity to translate the words into English for transmission as with a telegram. The telephone service of the Pacific Telephone and Telegraph Company extends from San Diego on the south, which is in the same latitude as Savannah, Ga., to Redding on the north, which is in the latitude of Boston, passing through almost every hamlet and town between these points. It is thus apparent that the Chinese in California are well served telephonically.

There are no Chinese subscribers to the service of the New York Telephone Company in New York city, although there are pay offices located in the territory in which the Chinese live. In New York city there are about 2,400 Chinese, and about 600 in Brooklyn. While many of these are possessed of considerable wealth and influence, yet their business connections do not demand the telephone service that is required in San Francisco, where their numbers are so much greater.

TOLD IN THE DYNAMO ROOM.

"Whew! it's cold enough to freeze a brass monkey!" exclaimed the lineman, as he came into the station, throwing a small coil of wire into a corner and slinging a pair of climbers under the bench, just missing Meg, the dog, who, nevertheless, jumped with a yelp from her resting-place. The dog's name was Megohm, or Meg for short, because she offered so much resistance—to burglars and other unauthorized visitors. "Guess the Browns will have to get along with oil lamps or taller dips to-night; the converter is burned out, and there ain't another 40-lighter in the house; besides, if there was, I wouldn't go and connect it, with the thermometer around zero, and the wind cavorting around at a 30-mile gait. Not on your radiograph!"

"Do you think Mr. Brown will be pleased with such an arrangement?" asked the engineer, who had silently listened to Jim's wrathy remarks, and who was now deliberately biting off a chunk of rather black navy tobacco.

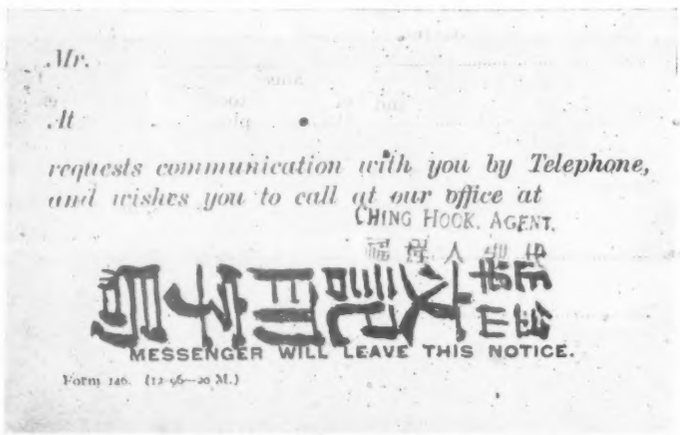
"Oh, Brown be blowed!" returned Jim, who, as line repairer, wire man and general electrician, had, in course of time, acquired a sort of autocratic authority around the Centerville Electric Light and Power Plant, such authority being subject only to the orders of Mr. Evans, the superintendent and manager, known among the other employés as "the boss."

"It just serves him right; he had no business turning on every blamed light in his house when his contract calls for only 40. I only hope the boss won't show up any more to-night, for like as not he'd suggest some of his new fangled schemes to give Brown light."

Just then Mr. Evans made his appearance, bidding a cheery "Good evening" to those present. "Hello, Jim, did you find the trouble at Brown's house?"

"Ye-es, sir, found the trouble all right—converter is burned out, and was just saying, it's no use trying to fix it a night like this."

"Oh, but we must," quickly replied the superintendent. "It will never do to leave Mr. Brown in darkness to-night. The maxim '*Never shut down*' applies to a customer as well as to the station. I believe there is to be a reception at his house


Mr.

At

requests communication with you by Telephone, and wishes you to call at our office at

CHING HOCK, AGENT.

MESSENGER WILL LEAVE THIS NOTICE.

Form 146. (12-05—30 M.)

FIG. 2.—THE SUMMONS CARD OF THE SAN FRANCISCO CHINESE TELEPHONE EXCHANGE. "COME TO THE CHINESE TELEPHONE OFFICE, QUICK."

this evening at nine o'clock. It is 7.30 now, so we had better be quick about it. Take about 300 feet of No. 4 wire, your climbers and a couple of 50-ampere fuses and we'll soon have the job done." Jim reluctantly complied, and the two started out.

"It do beat all, how that man Evans will find a way out of difficulties," remarked the engineer to Bert, the dynamo tender, who had been quietly filling the oil cups, and who was now filling a corn-cob pipe. "I wonder how he's going to fix it?"

"Oh, I can make a pretty close guess," replied the dynamo man. "You know the Baptist church is within 100 feet of Brown's house, and has a 50-lighter doing nothing all week, except Sundays, and I'll bet the boss'll make Jim hitch that on to Brown's wires."

"To be sure! I never thought of that. It shouldn't take them over 20 minutes," spoke the engineer.

"That reminds me of a scheme I was going to have patented once," said the dynamo man, who was known as "Mr. Edison" around the station, because he was continually relating about his numerous inventions. "The scheme was this," he continued, noting an encouraging smile on the engineer's face. "Each converter on the line is provided with a two-way, two-point switch, placed in the secondary circuit where it enters the consumer's house. One set of contact points is connected to the secondary terminals of its converter, while from the other two points a pair of wires is run to the next nearest converter, provided with a similar switch—like this" (taking a partially burnt carbon point and drawing a diagram on the floor).

"Here you have two converters—say number one and number two. Now, suppose number one burns out, all you have to do is to throw the switch, and the load is thrown on the next converter."

"Hum! that's not a bad idea, Edison; but suppose that next converter happens to be already carrying a pretty big load?"

"Oh, well, you'll have to take chances on that," replied Bert. "It's a good scheme, anyway."

"Yes, a lazy man's scheme. And there are the boss and Jim back already."

"And Mrs. Brown's reception will be a brilliant affair," spoke Mr. Evans, who had heard the engineer's last remarks. "You see, boys, there must be no such word as *can't* in our business," he concluded, having told for the benefit of the other two, how Jim and he had cut Mr. Brown's lights over to the idle converter on the church. Having taken a final look at the volt and amperemeters, he bade the men good-night and went home.

"Jim, I guess that's one on you," spoke the engineer.

"All right; Evans don't know it all either. He's a nice enough fellow, but some day he'll get the spots knocked out of him like the chap in Emporia the time I was putting in their arc light plant."

"How was that? Tell us about him," the engineer and Bert asked.

"Well, it was like this: I had been sent there by the Imperial Company to put in a couple of 30-light machines, and the plant was all finished, running on 30 days' trial. Of course it was my business to see that everything went without a hitch during that time, because the members of the local company were all kickers, and especially the secretary, who was also to be manager as soon as the plant was accepted. There was hardly an evening but he'd bring some friends or acquaintances to the station to show them the new light, and often he had several ladies with him. The machines had run about a week, slick as grease, when one evening the one nearest to the railing commenced to get pretty warm at the commutator bearing. Of course I tried all possible means to cool the bearing off, but finally had to resort to a large wad of wet waste, kept constantly on the journal, and supplied with cold water from time to time. This kept her tolerably cool, and everything would have been all right if that secretary, his wife and two other ladies had not just then made their appearance. I didn't think they'd stay long, and not wishing that fellow to know anything was the matter with the machine, I yanked off the waste, and looked as innocent as possible. Now, whether that secretary wanted to show how much he didn't know or not, I don't know, but it must have been some 15 or 20 minutes before he got through explaining all about the engine and switchboard, and finally stopped right in front of that unlucky dynamo. The bearing must have been pretty hot by that time, when Mr. Secretary said, turning to the ladies, 'And this is where we generate our——'; with that he reached over the railing, and laid his hand on the smoking journal—'Holy smoke! ——! ——!'"

"'Why, Louis, I never heard you swear like that before,' reprovingly exclaimed his wife; and with that they all turned to go. The secretary never said another word, but went out with the visitors, and his right hand was swathed in bandages for some time afterwards."

"That was rather rough on the secretary," spoke the engineer.

"It was just as rough on the dynamo," said Jim, "for the next morning I had to re-babbitt that journal."

Electric Locomotive on the Hoboken Shore Road.

The use of electricity for switching purposes on a steam railroad, in place of the noisy drill engine, takes another step forward, this time on the Hoboken Shore Road, Hoboken, N. J. The full name of this road is the Hoboken Railroad Warehouse and Steamship Connecting Company. It runs from Seventeenth street, Weehawken, to Fourth street, Hoboken, along the water front, or from the Erie tracks at Weehawken to the docks of the North German Lloyd Steamship Company, Hoboken, a distance of about two miles.

The switching of the cars for the past three months has been effected by a repair car of the Hudson County Electric Railroad Company. The new electric locomotive was put into regular service on January 4, 1898, hauling trains of loaded and empty freight cars between the docks and the Erie track. The difference in its operation from that of the common drill engine is immediately noticeable. The electric locomotive responds instantaneously to the movement of the controller handle and starts without jerk or noise, tightening up the couplings uniformly or coupling the cars together so gently that no blow is perceptible.

FIG. 1.—GENERAL ELECTRIC COMPANY'S LOCOMOTIVE, HOBOKEN SHORE ROAD, HOBOKEN, N. J.

The locomotive was constructed in the shops of the General Electric Company, at Schenectady, N. Y., and somewhat resembles in appearance several other electric locomotives built by them. It is mounted on two four-wheel trucks, each axle carrying a General Electric 2,000 motor, giving the locomotive a total of 540 rated horse-power. The weight on the drivers is 57,200 pounds; the draw-bar pull is 10,000 pounds. The locomotive is driven through a single reduction gear of a very low ratio. The speed is correspondingly low, and is rated at eight miles an hour when hauling a heavy load.

At each end of the locomotive is an automatic coupler, and a small railed platform for the brakeman in charge of the trolley pole. The cab is of iron and resembles a double steam locomotive cab, with a sloping tender shield at each end. Drop windows are set around the four sides of the cab, affording an unobstructed view in all directions to the motorman. On each shield is a headlight; in addition one shield carries a bell, the other a chime whistle. Beneath one of the shields are four packed card resistances, two sand boxes, the compressed air tank and the equalizing air tank; beneath the other, eight resistances, two sand boxes and the engineer's tool box. At one end of the cab is placed a controller of the series parallel type known as the L-2. It contains a magnetic blow-out, and is arranged to operate the motors either four in series, or each two in series-multiple. Beside the controller is the air-brake handle and the two valves of the sanding arrangement, by means of which the sand is blown by the compressed air under the wheels.

FIG. 2.—INTERIOR OF CAB, GENERAL ELECTRIC COMPANY'S LOCOMOTIVE.

In front of the motorman is an air-brake gauge, and above it an ammeter reading to 500 amperes. Fastened to the roof of the cab is an L automatic circuit-breaker set at 500 amperes. On the other side of the controller, from the motorman, is an M circuit-breaker and an automatic governor switch for the air pump placed at the other end of the cab. This is a single-cylinder pump driven by a three-horse-power iron-clad bipolar slow-speed motor. The operation of this air pump is automatic. When the air in the tanks is at normal pressure the governor switch is opened. Blowing the whistle, applying the brakes, or using the sander, causes the pressure to fall. This closes the switch automatically and starts the motor and pump.

The overhead wire is 00 suspended from wires strung between octagonal cedar poles, except at two or three points, where bracket construction is used. Where the locomotive turns in from Hudson avenue to the river walk, a peculiar condition has caused a special method of bracket construction. It was necessary for the overhead line to be so set as not to infringe upon the limit of the next property. Thus, at this point, the overhead line is suspended from two bracket arms, one 6 feet and the other 18 feet long. The current for the road is taken from the station of the Hudson Electric Light Company.

PERSONAL.

Mr. T. J. McTighe, the well known electrical and mechanical engineer, has removed his office to Room 75 Boreel Building, 115 Broadway, New York city.

Dr. Thomas M. Drown, president of Lehigh University, has almost wholly recovered from a three months' illness, and will shortly be able to resume active management of the university.

Mr. Cyrus O. Baker, Jr., the platinum refiner, returned to New York last week after an absence in the West of several months. His numerous friends extended a cordial and continuous welcome.

Prof. Alexander Melville Bell, the father of Prof. Alexander Graham Bell, the inventor of the telephone, was married on January 1 at the Park Avenue Hotel, New York city, to Mrs. Harriet G. Shibley, of Harrowsmith, Ont. Among those present at the ceremony were Prof. Alexander Graham Bell, his daughter, Miss Elsie Bell, and D. C. Bell, brother of the bridegroom.

The Habirshaw Celebration.

On Friday afternoon, December 31, the usual New Year's reception was held in the offices of the India Rubber and Gutta Percha Insulating Company, 15 Cortlandt street, New York city. The hosts of the occasion were James W. Godfrey, F. W. Harrington and J. B. Olson. The offices were crowded all the afternoon with the many friends of the company who were supplied with bountiful solid and fluid refreshments. Professional troubadours were also on hand to amuse the throng. The function was a thorough success.

Meekin, The Lazy Inventor, Discovers an Electrical Cure for Dipsomania.

It was nine o'clock at night. The ELECTRICAL REVIEW office was deserted except for a hard-working member of the editorial staff and one small office boy, who was licking the last stamp preparatory to going home, when an apparition appeared in the doorway. The form, in its outline, resembled in every respect that of Meekin, the lazy inventor, but it was embellished on one side by a crutch and on the other side by a cane. The gentleman referred to, who had not frequented the ELECTRICAL REVIEW office for many months, ambled into the room in a halting fashion that suggested trouble in the recent past. After an exchange of greetings, and the acceptance of a cigar, Meekin appropriated the editorial chair, placed his feet with delicate care upon the desk, and relieved himself as follows:

"Yes, I have been away a long time. The fact is, I have been broke, dead-broke. As you know, I am a man of ideas, all of them original but none commercial. Nevertheless, I shall keep on inventing until, like many in the past, I shall reap my reward. You recollect the man who invented the gimlet-pointed screw, the man who first thought of pins, Fulton the steamboat fellow, and——"

"But where have you been, and what has all this to do with your present d— dam— damaged state of health?" the tired editor interrupted.

"As I was saying, I have been broke—so flat on my back in fact that I was obliged to go up to the old family home in a little town in the interior of New Hampshire, and simply hibernate. I tramped considerably up there; in fact, nearly covered the state, and I was largely impressed with the lack of good liquor, or liquor of any kind, to be had publicly within its domains. At the same time, and perhaps as a direct consequence, every one I met seemed to be of the hard-working sort, much too hard-working to suit my taste, and yet every once in awhile I would come across a man who had all the appearance of what in New York would be called a 'gentle jag.'

"I got a good insight into the matter one day merely by chance. I had observed that about a quarter of a mile down the road from where I was staying there was a house inhabited by four men who never seemed to have much to do except to wander off frequently with fishing poles over their shoulders, and, at other times, to exhibit all the symptoms of a 'gentle jag.' After inquiries among my relatives, I was informed that the Jones brothers, down the road, were a shiftless lot, and that they had inherited the scraggly farm on which they lived from their father, who died two years before. The old man in his day had carefully cultivated the apple orchard and had made large quantities of cider. After his death the boys discovered that in the cellar of the house were 56 barrels of cider from 1 to 10 years old. They had deliberately knocked off work, stifled all desire for improvement, and had set themselves to the task of drinking up that cider in the cellar. It seemed at first they all tackled the job at the same time, all acquired 'gentle jags,' and starved in unison. When the matter of food became imperative, they decided to divide themselves into relays, which were to alternately drink cider and fish, as that was the easiest way to secure food.

"So, every Tuesday, Thursday and Saturday morning at 10 o'clock you would see Bill and Jim saunter down the road with their fishing-poles. That was a sure sign that Jack and Tom were enjoying a quiet booze in the cellar. On Mondays, Wednesdays and Fridays Jack and Tom would carry out the fish-pole game, and Bill and Jim would retire to the cellar. What did they do Sunday? Why, they went back to their first scheme and all got drunk. That made it a little hard on the Monday, Wednesday and Friday fellows, and that was the only thing the matter with their scheme. As I afterwards learned, they explained this by saying that the Monday, Wednesday and Friday fishing fell to the lot of Jack and Tom, because they held the palm of seniority among the four brothers, and it was right that they should assume the most ardent responsibilities.

"Well, when I had heard this story piecemeal, and had gradually patched it up into a whole, I made up my mind that it was my duty to prevent such a waste of good liquor if I could. Of course, there was but one way to do it, and that was by electrical means of some sort or other. And, too, it was important for me to get to the cellar. I bided my time, and finally secured a chance to sneak into the cellar of the Jones's house while Jack and Tom were enjoying their noonday boozy snooze—say, that has a zig-zag jag sound—on the porch. I rigged up a circuit down there between the hoops of a barrel and the fluid inside, sneaking the wires out through a cellar window, through the tall, rank grass to an adjacent fence corner. Then I attached the two sides of the circuit to the terminals of a magneto testing bell, and waited until Bill and Jim returned from their fishing trip. I knew they would have a good old thirst, and I knew they would go for that same barrel I had rigged up, because it was the only one in the cellar that was not entirely devoid of contents or with an unsealed bung.

"I allowed them sufficient time to get to work on the barrel. Their method of procedure, as I had previously learned, was for a brother to sit on either end of the barrel, facing the bung-hole in the middle; then they would proceed to drink their fill of hard cider from a straw. When I presumed a sufficient time had elapsed, I gave the crank of the magneto bell a few sharp turns, at the same time holding my other hand on the bell to prevent any sound. In a holy minute there were the most devilish yells proceeding from the cellar that you ever heard. Bill and Jim bounced up the stairway, grabbed Jack and Tom, and proceeded to maul them all over the place. Their language was explosive and incoherent; but, at the same time, I was able to infer that Bill and Jim accused Jack and Tom of having put poison of some sort in the barrel. As the fight took on a more serious character, my altruistic spirit arose, and I determined to avoid fratricide if I could. I jumped the fence and attempted to separate the combatants. In a second the whole four turned on me, with the result that you see. I have been wearing this crutch and this cane ever since. The path of the reformer is covered with thorns. The electrical inventor is oftenest fouled when his hopes are ripest. Selah!"

What Happened to the Eagles Which Perched on a Transmission Line.

A nomadic electrical engineer and inventor, recently returned from the Pacific Coast, relates the following as a true story for which he is willing to vouch:

"A few weeks ago a great American eagle, which had been born and brought up in California, and was, therefore, a sound-money advocate, was making a visit in the vicinity of Fresno, Cal. While he was waiting around on the mountain side for his friends to appear, he became weary and decided to alight in some convenient place for an interval of rest. He happened to land on one of the bare wires of the electric transmission line coming down from the mountains into Fresno.

"While enjoying his siesta, an eagle came along whom the California bird at first mistook for one of his friends. The stranger also made the mistake of supposing that the California eagle was a friend of his, consequently he alighted on another wire of the transmission line directly opposite and began a conversation. In the course of the talk it was discovered that the new comer was a Nevada bird, and consequently a rabid free silverite. It is much the same with the feathered things of the air as it is with human beings; that is to say, that the course of conversation naturally turned to politics, and from that to a discussion of the money question.

"The crisis came when the birds passed from words to blows. The man who saw the fight is not exactly certain in his own mind who struck first, but he is positive that when the beaks of the two eagles met, the only thing that he could see was a cloud of smoke and a flash of lightning. Closer investigation revealed the fact that immediately under the perches formerly occupied by the two eagles were two pairs of claws, two beaks and several bushels of scorched and pungent feathers scattered over the scenery. The puff of smoke included the balance of the remains.

"But here is where the real damage was done. When those two eagles crossed their bills they short-circuited the line and caused an arc, which was maintained for some minutes, between the two opposite sides of the line, until the copper was melted through and the circuit was broken. A search party was sent forth to discover the cause for the lack of electric power in Fresno, and it was several hours before the damage was repaired. The linemen who straightened out the tangle have preserved the beaks and claws of the birds and several of the feathers found on the ground. This is all the proof that any sane man would require as to the actual occurrence I have described."

As to Scientific Papers in England.

[*From London Lightning.*]

Mr. Bright rose to make some suggestions for expediting the work of the institution (of electrical engineers) by giving greater publicity to the papers and omitting the actual reading of them, but the president and others thought that under such a scheme many papers might never be read by any one but their authors.

POSSIBLE OR PROBABLE DEVELOPMENTS IN THE ELECTRICAL FIELD DURING 1898.

BY S. H. SHORT.

[*Written especially for this issue of the* ELECTRICAL REVIEW.]

In order to be a successful prophet it is necessary, in some measure, to review the past; and, in outlining very briefly a few of the tendencies of electrical development, and perhaps hazarding a guess at some of the changes likely to take place during the new year, we may barely glance at what has been done already. The generation of direct current for lighting, power or whatever purpose has been brought to a degree of perfectness never before equaled in any field of engineering. Dynamos, motors, lamps—in fact, all apparatuses designed for the production or use of the direct current—are at present marvelously efficient instruments for the conversion of energy from one form to another.

No sooner, however, had direct-current apparatus begun to settle into conventional and well approved lines than the multiphase alternating current claimed first attention, then consideration, and, finally, adoption for purposes where the direct current was impracticable. The use of static and rotary transformers contributed a marvelous flexibility to this form of electrical energy, which now is supplanting all other forms where a primary and natural source of power is available to drive the machines. Nor has this method of supplying power over great areas been used as yet, except in comparatively rare instances. A few plants here and there; yet these are constantly multiplying, and, one by one, the waterfalls are being harnessed to the generator.

Scarcely has this improved method secured recognition as being practical and desirable, than from several sources at once appear devices for the production of electricity directly from carbon. These, it is true, are more or less crude and imperfect, and the experimenters are but few, but they are men in the foremost ranks of electrical engineering to-day, and sooner or later their efforts must be crowned with success. That this success will come during the coming year may seem doubtful, still it is one of the possibilities of 1898.

Meanwhile inventors will not cease their efforts toward improvement in the modern machines. The most important application of electricity to-day is that of mechanical traction, and as this is applied more and more, year by year, to heavier and still heavier burdens, changes must come in the apparatus. It is, perhaps, safe to predict for 1898 a change from the single reduction to the gearless motor for heavy high-speed traction. There are difficulties in the way, but all indications point to the change.

Then, again, the present system of car control, while admirably suited to street cars or individual high-speed cars, has many disadvantages when applied to heavy trains. Some better system will be devised whereby the entire train will be under perfect control by the "motorman." Rapid starting, rapid stopping without jolt or jar, and perfect control in case of emergency, must be provided for before inventors will turn their attention from this particular field. 1898 should see this problem successfully solved.

Every year sees improvements, new devices, more perfect machinery, a wider application of the wonderful electric power, and a greater number of men devoted to its interests and extension.

The year 1898, with its promises of prosperity in every field, must surely have many good things in store for electricity and the electrical profession.

$20,000 for Loss of Both Hands.

Louis M. Packer, of Lynn, Mass., who brought suit against the Thomson-Houston Electric Company for $100,000 for the loss of both hands in an "undercut" machine at the works of the company, nearly two years ago, has obtained damages in the sum of $20,000 from a jury in the Superior Court at Salem, Mass.

American Stoker Company.

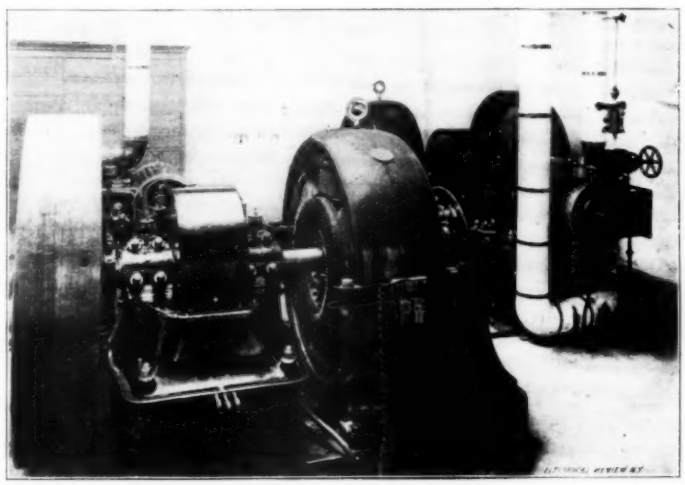
The American Stoker Company, formerly of Dayton, Ohio, have taken offices in the Garfield Building, in Brooklyn, N.Y., where they are doing an extensive eastern business. Hereafter Brooklyn will be the headquarters for all their western and eastern business.

The new stoker is a system of underfeeding the coal, by which all the gases that accumulate are mixed with a certain amount of air and, to a great extent, are consumed by the action of the flame before reaching the stack, thereby utilizing every ingredient in the coal. The coal is first fed into a retort, and then gradually forced upward through the Tryere blocks. The feeding is continuous, and by thus keeping the coal agitated a proper amount of air, necessary for mixing with the gases, is circulated through it.

The amount of the current of air is regulated by means of a wind-gate, controlled by a lever, so that it can be fed in such amounts necessary for the supply of coal. By this means a fire can be quickly forced to meet a sudden demand, and as quickly reduced. It is especially adapted for power-houses and the like, where a sudden call for increased capacity is necessary.

The company are getting up a very handsome catalogue, with illustrations of different parts of their machine, which they will publish early in February.

A corps of 300 soldiers, under the direction of the British South Africa Company has, during the past few months, constructed over 200 miles of telephone lines in Matebeleland, in addition to performing a regular routine of patrol, garrison and police duty.



A COMPACT LIGHTING PLANT AT THE MILWAUKEE MEDICAL COLLEGE.

A Compact Lighting Plant.

Isolated lighting and power installations have been described and illustrated so often that the subject has become rather trite, and it is only when a plant possesses special features of interest that more than passing attention is paid it. The electric lighting apparatus and engines, recently installed in the Milwaukee Medical College, Milwaukee, Wis., show in a striking manner the perfection and simplicity that have been reached in this direction. Our illustration shows, in a room scarcely larger than an average sitting-room, two 60 kilowatts 125-volt "Northern" dynamos, each driven direct by an 11 by 12 Ball engine at 300 revolutions per minute. Either generator is sufficient to supply the building with current for some 450 lights, and for the electric elevator, which requires from 60 to 70 amperes. Thus, one set is always in reserve, and a shut-down for more than a small fraction of time is practically impossible.

A handsome switchboard of Tennessee marble has been furnished by the Jul. Andrae & Sons Company, which was also the contractor for the wiring. A pair of Queen-Wirt ammeters show the current on either machine, while a volt indicator of the same type can be switched on either side. Two 60 inches by 16 feet boilers furnish steam for engines and heating purposes. These were furnished by the L. Mueller Furnace Company, the contractor for the power plant.

Both engines and generators have performed their functions perfectly since the plant was first started, the engines varying less than two per cent in speed upon a load of 475 amperes being thrown suddenly on or off, while the generators maintain a constant pressure under the same conditions. The entire plant is very compact, simple and efficient, and reflects much credit upon the several contractors who contributed to its completion.

Engineers' Club, Chicago.

There will be a meeting of the Engineers' Club of Chicago, at 1800 Fisher Building, on the evening of January 7, 1898, at 8 o'clock, to listen to Mr. Edward B. Ellicott, city electrician, on "Fire Alarm Systems." On Friday, January 8, the club and their friends visit the City Railway's power plant at Forty-ninth street and Oakley avenue, leaving the club rooms at 1.30 P. M. sharp.

Electrical Review

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SPECIAL NOTICE TO ADVERTISERS.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue.

NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

NEW YORK, JANUARY 5, 1898.

Views, News and Interviews..... 1
The Chinese Telephone Exchange in San Francisco..... 1
Told in the Dynamo Room..... 2
Electric Locomotive on the Hoboken Shore Road..... 3
Personal..... 3
The Habirshaw Celebration..... 3
Meekin, The Lazy Inventor, Discovers an Electrical Cure for Dipsomania..... 4
What Happened to the Eagles Which Perched on a Transmission Line..... 4
As to Scientific Papers in England..... 4
Possible or Probable Development in the Electrical Field During 1898..... 5
$20,000 for Loss of Both Hands..... 5
American Stoker Company..... 5
A Compact Lighting Plant..... 5
Engineers' Club, Chicago..... 5
Our New Form..... 6
Vacuum-Tube Lighting and Photography..... 6
The Leaven of '76..... 6
The Trolley and the Brooklyn Bridge..... 7
Late News..... 7
Edison on the Incandescent Lamp..... 7
The Incandescent Lamp of To-day..... 7
Tesla's Latest Advances in Vacuum Tube Lighting..... 8, 9
The Year in Electrical Financial Circles..... 10
The Montauk Multiphase Fire and Burglar Cable..... 11
Trolley Cars on the Brooklyn Bridge..... 11
Vallee Brothers & Company..... 11
Roentgen-Ray Notes..... 12
The Electrical Show in Madison Square Garden 12
Benefit for a Disabled Conductor..... 12
A New Lighting Company..... 12
When the Load Was Shifted..... 13
Frink's Special Patent Window Reflector..... 13
Our Canadian Letter..... 13
The History of the Telephone..... 14
The Phœnix Double-Pole Telephone Receiver.. 15
Locke's High-Potential Insulating Specialties.. 15
The National Association of Manufacturers.... 15
Novel Cabinet Desk Telephone..... 15
Electrically Protected Hens..... 15
Armington & Sims' Factory in Providence Sold 15
A Roentgen Society in New York..... 15
Advance Information..... 16
Kindred Interests..... 17
Electrical Patents..... 18
Some Special Advertisers..... 18
Western Notes..... 18

Advertisers' Alphabetical and Classified Index on page xii.

OUR NEW FORM.

After considerable thought and many conferences with those well qualified to judge, the ELECTRICAL REVIEW, as has been heretofore announced, has decided to change its form and size. The current issue of this journal is sent forth in the new form, with the hope that it will meet with the approval of the majority of those into whose hands it will fall. We admit that it is far short of the ideals which we have established for ourselves, but trust that the many plans which we have made for the betterment of the paper will produce results directly beneficial to the electrical and kindred industries.

Although the change in the page size of the ELECTRICAL REVIEW will, in the opinion of many, be of more convenience to the reader, we do not hesitate to say that it has been made at a considerable expense to the publishers. At the same time the decrease in the size of the page compels us to reduce the prices formerly charged for advertising space. This, we believe, will confer a benefit on many of the smaller concerns in the electrical field which have been heretofore deterred from making their products properly known on account of the prices for space prevailing in the past. It goes without saying that even the largest firms in the business will appreciate these lower rates, especially as they refer to business-bringing publicity in a journal of the age, character and influence of the ELECTRICAL REVIEW.

We do not expect to set the world on fire nor to short-circuit our competitors, but we do believe that the changes we have made and the carrying out of the plans which we have developed will result in better returns to all. We can not, of course, please every one, but to those who prefer the form in which the ELECTRICAL REVIEW has appeared for 15 years, we would say that their criticisms will be received, as they always have been, with the utmost respect and consideration.

We are firm in the belief that the dawning of the new year is the harbinger of a period of prosperity, along all the industrial lines, in which the electrical field, by its own great importance and power, is bound to share most profitably. The ELECTRICAL REVIEW intends to do everything within its power to make this true, and trusts that it may merit, as in the past, the advice and co-operation of those who appreciate clean, honest and respectable technical journalism.

VACUUM-TUBE LIGHTING AND PHOTOGRAPHY.

Electrical progress of the new year is auspiciously begun by a most important advance in vacuum-tube illumination, made by Mr. Tesla, which it is our honor to chronicle elsewhere. He reports remarkable progress in the efficiency of the light produced. The results are of the most surprising kind, particularly in point of intensity of the light. Surely no one could have foreseen that the candle-power of a vacuum tube could ever be augumented so far as to rival, or even to surpass, the most intense available sources of light. Its possible application to light-houses is, as Mr. Tesla remarks, truly the "oddest and most unlooked for development of the vacuum tube." The advent of this novel and powerful illuminant will, according to the photographic results obtained and in the opinion of experts, undoubtedly cause the supersedence of the objectionable flash-light. It will also, what is far more important, make the photographer entirely independent of the sunlight, and will enable him to exactly adjust the conditions necessary for the attainment of the best results. The bearing of these advances on practical illumination is obviously important.

"The people, not the telephone, were on trial," says our correspondent, Geo. C. Maynard, in describing the early efforts to prove to the public the value of this wonderful and useful instrument. True enough then, but the people soon responded and the telephone and its exchange systems were put "on trial," and still are, to equal the demands of new users. In no one field, it is our belief, will there be greater extension during 1898 than in that of the sphere of the electric speaking telephone.

When fifteen years have gone by a sudden change of habits is seldom made without a shock or wrench of some sort. This is the first issue of the ELECTRICAL REVIEW in a new form, and, of course, it isn't perfect. We will thank our friends for their criticisms on the make-up, appearance and arrangement of the paper. Voice your thoughts without fear.

THE LEAVEN OF '76.

Before the opening of the Centennial Exhibition, in its day the most wonderful display of the handiwork and progress of man the world had ever seen, the powers and wonders of the electric current had been but little known. The field had been but slightly gleaned; its richest treasures had remained unseen, or in unfamiliar guise had been passed by in blissful ignorance; light was still wanting to illumine the myriad gems there trodden underfoot, unknown. An occasional gem had been uncovered by the handful of prospectors who delved for the love of their science, producing a fitful glimmer of twilight which but dimly outlined the pathways.

Then came 1876, and with it, flushed with the sleep of ages, modestly and quietly appeared new stars which shot the field of discovery with dazzling beams of light and started its sluggish growths into an activity destined to astonish the world.

Brush put to flight the imps of darkness and filled our nights with sparkle and life; Bell set the whole world throbbing with his magic undulations; Edison, already known for his many achievements in telegraphy, gave the indoor world that gem, the incandescent lamp. The world was brighter and better. The leaven began to work with astonishing rapidity, and in a few short years the growth of improvement has been truly electrical and such as the world had never known.

The commercial dynamo soon showed the way to a commercial motor, and with great energy and enterprise Frank J. Sprague pioneered the successful electric railway motor.

Thousands of enthusiastic and reckless students rushed into the new diggings to delve for the diamonds of invention already seen to glisten in the new light. Thousands of hard-headed business men threw their capital and their energy into the many channels of enterprise thus disclosed. Thousands of mechanics dropped their well worn tools and took up the weapons of the new

warfare of science. Thousands of new enterprises came into existence involving applications of the electric current, and millions upon millions of money were invested in them. Many of the older industries received a vivifying impulse from the leaven, as great quantities of supplies had to be furnished for the marvelous growth of the young giant, whose active steps led him in every direction.

And to-day there is hardly a merchant, manufacturer, banker, broker, lawyer, doctor or other professional worker, mechanic or laborer who does not, one way or another, in his daily life, actually depend upon the electric current to help him earn his daily bread or enjoy its pleasures.

Truly the leaven has worked.

The Trolley and the Brooklyn Bridge.

One of the sensational daily papers recently appeared with illustrations and scare-heads and tried to show how with the trolley lines on the Brooklyn Bridge, that noble structure is doomed to an early and watery grave. Figures are given and alleged laws quoted and twisted to bolster up the sensation and show how the current will leak from the track-rails, skip across and climb up into the big cables, slide down these to the New York anchorage and then commit the now unlawful act of jumping from the Bridge—the point selected by this recreant current being the looped ends of the cables where they are hitched to the anchor-grids at the New York end—bang into the solid masonry and cement, dragging along with it tons of the steel wire daily.

The aforesaid journal says:

"One ampere will destroy two tons of iron per year. Two hundred and fifty amperes will take away 500 tons of iron per year."

Professor Crocker, of Columbia College, by an evident misquotation is made to say that one ampere will dissolve 4,375 pounds of iron per year. Dr. Sheldon, of the Polytechnic Institute, Brooklyn, is quoted as authority for saying the leakage would be 250 amperes on the average. Another expert is quoted to show further points of danger, and on the whole quite a good piece of sensationalism is presented. It is all very striking, of course. But what about the facts?

Under the most favorable laboratory conditions iron can be dissolved at the rate of 1.04 grammes per ampere per hour, or about 16 grains avoirdupois. With 8,760 hours, that makes 140,160 grains per year, almost exactly 20 pounds! 250 amperes then could dissolve 5,000 pounds per year, but only under the most perfectly planned conditions, and in ferrous sulphate solution as the electrolyte, and constant care and attention. There must be an acid present; water or moisture will not do; and in dissolving the iron must be changed into a salt, either a sulphate or a chloride of iron.

For the sake of the *reductio ad absurdum*, let us admit there is plenty of acid solution away up in the solid granite of the anchorage. Sulphate of iron must consist of iron, sulphur, oxygen and water, in the proportions of 56 parts of iron, 32 parts of sulphur, 64 parts of oxygen, and 126 parts of water, making the crystallized salt, which, for solution, requires about 400 parts of water. Hence 500 tons of iron would form about 2,500 tons of the salt, or 6,000 tons of the solution. Will the aforesaid current be forehanded enough also to excavate a reservoir to receive these 300 carloads of ferrous sulphate? It will have to hustle, for such a train of 300 cars would be longer than the Bridge itself.

A very graphic drawing is presented, showing the construction of the anchorage, and a point is marked where the foolish current is to commit bridge-jumping; namely, where the cable wires pass around the front roller of the grid. We always thought a current would take all possible paths presented, but that grid must be full of "jaggers" which this crazy current dislikes. But why should it take all the trouble of climbing into the heavily painted cables, making a forced march all the way to the New York end, and then, with a parting smash of the wires at the anchorage, dive down into the river and swim back home, when it has a route so much easier? The iron and steel of the structure weigh about 14,000 tons, or about three tons per running foot, or nearly three times as much as all the cables put together. Such a mass would be equal to a continuous plate of copper five inches thick and 60 inches wide, along which even 10,000 amperes could glide so comfortably that even one solitary deserter would disdain the more troublesome gymnastics of a trip by cable.

The citation of the electrolytic damage alleged to be going on in Brooklyn is not to the point. There is no doubt that the Brooklyn trolley systems are indefensibly deficient in their return circuits. Any observer can discover that fact any day. But that can not affect the bridge. All the latter needs is a generous return circuit, without break or faulty connection, and the engineers of the structure are likely to see this requirement provided with an abundant factor of safety.

LATE NEWS.

The Chicago Electric Traction Company has been incorporated at Springfield, Ill., with a capital of $2,000,000. The company will at once issue $1,500,000 of first mortgage bonds. The capital is said to have been supplied by bankers and business men of New York and Philadelphia. Among these are Samuel R. Shipley and Henry Lewis, of Philadelphia, and Isaac L. Rice, Gustave J. Wetzlar and Jules S. Bache, of New York city. The Calumet Electric Railroad, whose securities swamped the National Bank of Illinois several months ago, is the leading asset of the new concern. It is stated that the company has already acquired by purchase 12 franchises in the southern part of Chicago. On four of these grants 32 miles of track have been built, and are now being operated by the Calumet Electric Road. It is said that before Summer the new company will have in operation 100 miles of track.

W. K. Burkholder, of San Francisco, has gone to Alaska to erect an electric plant to operate an electric road over the Chilkoot Pass. Electricity will be generated at Dyea and transmitted 20 miles to the point where it is to be used. At the pass the telpherage system will be used. In addition to the electric wires the poles will support cables, from which heavy cars will be suspended. The motors will be stationary, and the cars will be propelled up the incline by the cables on a drum. The machinery has already been shipped, and the plant is expected to be in working order in about three months.

A London *Daily News* correspondent says there have been some extraordinary discoveries of bullets in wounded men in Sir William Lockhart's campaign by Surgeon-Major Beaver, of the Coldstream Guards, who has come from home with a Roentgen-ray apparatus. At Karappa he showed the correspondent photographs of cases which had puzzled the doctors, and which had led to a good deal of ineffectual probing for bullets. His apparatus had instantaneously discovered where they lay.

Edison, satisfied with the success of his iron mining, is now ready to enter the field of gold placer mining. Contracts have been in his desk for six months awaiting his signature to begin this work. It will be entered upon where the low-grade gold deposits are vast and extensive, as the construction of the mills is very expensive. Many discarded placer mines will undoubtedly become very valuable because of Edison's new process.

EDISON ON THE INCANDESCENT LAMP.

From His Mines in New Jersey He Speaks Through The "Electrical Review."

THE EMINENT INVENTOR FIRMLY BELIEVES IN A MORE ECONOMICAL LAMP, AND THINKS COUNTLESS EXPERIMENTS STILL LEAVE IT WITH MANY UNDEVELOPED POSSIBILITIES.

To the Editor of Electrical Review:

You ask as to the possible or probable improvement in incandescent lamps. To this I beg to reply that I have always been a firm believer in the possibility of improving very materially the economy of incandescent lamps.

No one seems to be able, as far as I know, to go beyond a certain point, but this is not strange when we consider how little is known about an incandescent lamp by the very best experts, even with their countless experiments.

Yours very truly,

Thomas A. Edison.

Edison, Sussex Co., N. J., Dec. 23, 1897.

The Incandescent Lamp of To-Day.

A prominent incandescent lamp maker, after years of experience, writes us as follows concerning the manufacture of the modern incandescent lamp:

"The excellent lamp makers of the United States are limited to a very small number. The business is, in fact, a scientific one to make lamps that will run alike all the time. It is quite easy to seal a carbon in a bulb and exhaust it, but it is most difficult to reproduce results and make an absolutely uniform lamp all the time. There are few manufacturers in this country who have obtained such results, and the difference in quality of lamps is remarkable to those who will take pains to ascertain by actual test the difference in returns of light for expenditure of energy. It is a question of education, and I believe that people are learning more about the use of lamps, and that there will be very little trade left for those who are not making a first-class product."

TESLA'S LATEST ADVANCES IN VACUUM-TUBE LIGHTING.

APPLICATION OF TUBES OF HIGH ILLUMINATING POWER TO PHOTOGRAPHY AND OTHER PURPOSES.

To the Editor of Electrical Review:

A few years ago I began a series of experiments with a view of ascertaining the applicability of the light emitted by phosphorescent vacuum tubes to ordinary photography. The results soon showed that, even with a tube giving no more light than the equivalent of one half of a candle, objects could be easily photographed with exposures of a few minutes, and the time could be reduced at will by pushing the tube to a high candle-power. Photographs of persons were likewise obtained at that time and, if I am not mistaken, these were the first likenesses produced with this kind of illumination. However, a number of facts, not pertaining to the subject presently considered, were observed in the course of these experiments which, had they been immediately published, might have materially hastened important scientific developments which have taken place since. To dwell on these and other experimental results obtained at that time, more extensively at the first opportunity, is one of my good resolutions for the coming year. A calamity, unfortunately, interrupted my labors for a short period, but as soon as I was able I took up again the thread of the investigation, which was not only interesting in connection with the principal object in view, but was also useful in many other respects. So, for instance, in making observations as to the efficiency or any peculiarity of the vacuum tubes, the photographic plate was found to be an excellent means of comparison, note being taken of the distance and time of exposure, character of the phosphorescent body, degree of rarefaction and other such particulars of moment.

Fig. 1.—"Tesla's Latest Advances in Vacuum-Tube Lighting." Photograph Made by the Light of a Single Vacuum Tube, at a Distance of Five Feet; Exposure, Five Seconds.

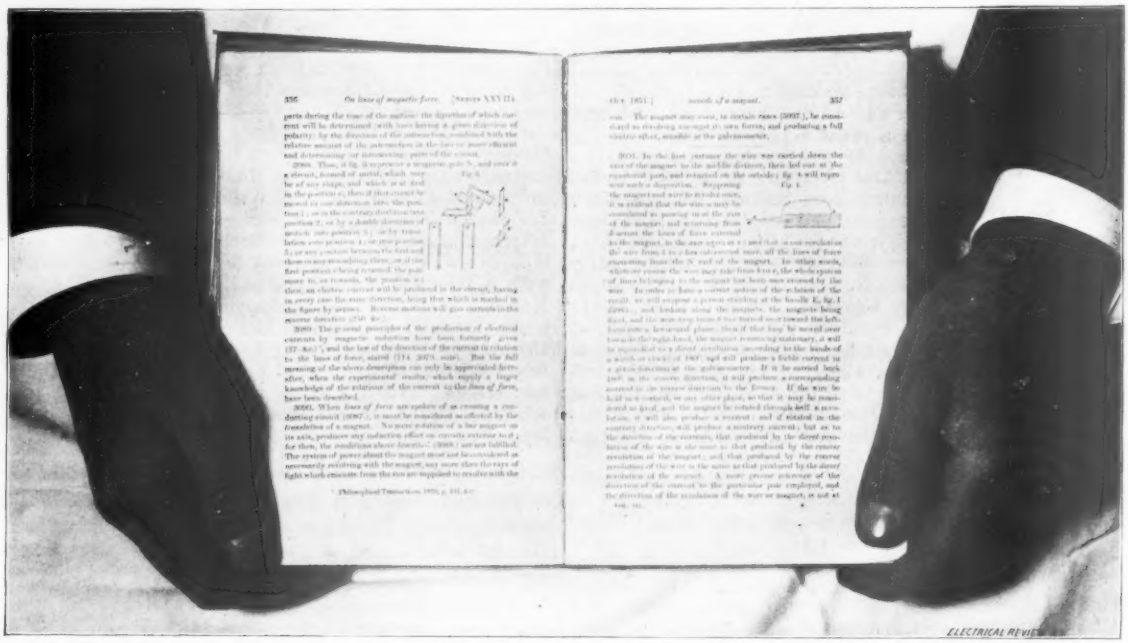


Fig. 2.—"Tesla's Latest Advances in Vacuum-Tube Lighting."—Two Historical Pages Photographed by the Light of a Single Vacuum Tube at a Distance of Four Feet; Exposure Two Seconds.

A rather curious feature in the photographs obtained with tubes of moderate illuminating power, as a few candles, was that the lights and shadows came out remarkably strong, as when very short exposures are made by flashlight, but the outlines were not sharp and practically no detail was visible. By producing tubes of much greater candle-power, a notable improvement in this respect was effected, and this advance prompted me to further efforts in this direction, which finally resulted in the production of a tube of an illuminating power equal to that of hundreds, and even thousands, of ordinary vacuum tubes. What is more, I believe that I am far from having attained the limit in the amount of light producible, and believe that this method of illumination will be eventually employed for light-house purposes. This probably will be considered the oddest and most unlooked-for development of the vacuum tube.

Simultaneously with this progress a corresponding improvement was made in the efficiency of the light produced. A few words on this point might not be amiss, considering that a popular and erroneous opinion still exists in regard to the power consumed by vacuum tubes lighted by ordinary means. So deeply rooted is this opinion which, I will frankly confess, I myself have shared for a long time, that, shortly after my own first efforts, Sir David Solomons and Messrs. Pike & Harris undertook to introduce in England such tubes on a large scale in competition with the incandescent system of lighting. The enterprise, which was commented on in the technical periodicals, was commendable enough, but it was not difficult to foretell its fate; for although the high-frequency currents obtained from the alternator yielded better economical results than interrupted currents, and although they were obtained in a convenient and fairly economical manner, still the efficiency of the whole system was necessarily too small for competition with incandescent lamps. The reasons for the great power consumption, which may often be as much as 10 times that taking place in incandescent

lamps for an equivalent amount of light, are not far to seek. A vacuum tube, particularly if it be very large, offers an immense radiating surface, and is capable of giving off a great amount of energy without rising perceptibly in temperature. What still increases the dissipation of energy is the high temperature of the rarefied gas. Generally it is supposed that the particles are not brought to a high temperature, but a calculation from the amount of the energy consumed during a given period of time, and the amount of matter contained in the tube, leads to results which would seem to indicate that, of all the means at disposal for bringing a small amount of matter to a high temperature, the vacuum tube is the most effective. This observation may lead to valuable uses of such tubes in astronomical researches, and a line of experiment to this end was suggested to me recently by Dr. Geo. E. Hale, of the Yerkes Observatory. As compared with these disadvantages the incandescent lamp, crude and inefficient as it undoubtedly is, possesses vastly superior features. These difficulties have been recognized by me early, and my efforts during the past few years have been directed towards overcoming these defects and have finally resulted in material advances, so that I find it possible to obtain from a tube of a volume not much greater than that of a bulb of an incandescent lamp, about the same amount of light produced by the latter, without the tube becoming overheated, which is sure to take place under ordinary conditions. Both of these improvements, the increase of candle-power as well as degree of efficiency, have been achieved by gradual perfection of the means of producing economically harmonical electrical vibrations of extreme rapidity. The fundamental principle involved is now well known, and it only remains to describe the features of the system in detail, a duty with which I expect to be able to comply soon, this being another one of my good resolutions.

FIG. 3.—"TESLA'S LATEST ADVANCES IN VACUUM TUBES."—PHOTOGRAPH OF THE EXPERIMENTER'S HAND MADE BY THE LIGHT OF A SINGLE IMPROVED VACUUM TUBE OF 1,000 CANDLES. EXPOSURE TWO SECONDS; DISTANCE FROM THE TUBE FOUR FEET.

The purpose of the present communication is chiefly to give an idea in how far the object here aimed at was obtained. The photographs shown were taken by a tube having a radiating surface of about two hundred square inches. The frequency of the oscillations, which were obtained from an Edison direct-current supply circuit, I estimated to be about two million a second. The illuminating power of the tube approximated about one thousand candles, and the exposures ranged from two to five seconds, the distance of the object being four to five feet from the tube. It might be asked why, with so high an illuminating power, the exposures should not be instantaneous. I would not undertake to satisfactorily answer this question, which was put to me recently by a scientific man, whose visit to my laboratory I still vividly recollect. Likenesses can, of course, be obtained with instantaneous exposures, but it has been found preferable to expose longer and at a greater distance from the tube. The results so far obtained would make it appear that this kind of light will be of great value in photography, not only because of the fineness of the lines, but also because the artist will be able to exactly adjust the conditions in every experiment so as to secure the best result, which is impossible with ordinary light. He will thus be made entirely independent of daylight, and will be able to carry on his work at any hour, night or day. It might also be of value to the painter, though its use for such purposes I still consider problematical.

I anticipate that much detail will naturally be lost in the reproductions through the half-tone process and press work, however good, but I hope that enough will be shown to demonstrate the advantageous features of this light in photography and its practical usefulness in this art.

In conclusion, I wish to thank Mr. R. L. Newman for kindly consenting to the use of his photograph.

NIKOLA TESLA.
New York, Jan. 3.

The Hudson River & Long Island Sound Railway Company, with its principal office in New York city, has been incorporated with a capital of $100,000, to construct a street surface road to be operated by electricity in Westchester County, about 10 miles in length, from the New York Central station in Yonkers, to the village of Pelham Manor, near the New York city line. The directors are Charles C. Bassett, of Washington; Henry A. Welch, of Detroit; James F. Secor, Jr., of Pelham Manor; D. B. Halstead, Paul Gorham and John H. Seed, of Brooklyn; Seward Baker and Walter R. Quick, of New York city, and William L. Stout, of Elizabeth, N. J.

The Year in Electrical Financial Circles.

The year 1897 has been one of substantial gains from a business point of view. It has been marked by a steady recovery in confidence, enhanced values for staples, with an accompanying broadening of demand that has extended to almost every line of trade.

In order to properly review these effects, it is necessary to touch upon the causes which were operative late in 1896. The national campaign in that year so disturbed confidence that business men, with hardly an important exception, reduced stocks of raw material and finished goods to the minimum. The sound-money victory was followed by a few weeks of buoyant feeling, but it was not sufficient to cause any permanent improvement in trade. Two weeks after the election the ultra conservative spirit again became dominant. This extended well into 1897. May was about the dullest month of the year. Values were at the lowest and business men generally discouraged. About this time evidences of good crops began to appear. These were followed by sharp advances in the prices of stocks and bonds of leading corporations. As the crops developed without any setback, this upward movement in securities became more pronounced. It assumed all the characteristics of a boom in August. About the time the wheat crop became assured and the corn crop nearly so, evidences were unmistakable that the crops throughout the world would be considerably less than consumptive requirements. Coincident with this was an increased demand for merchandise. The farmer in particular was a heavy buyer, owing to the increase in his purchasing power through advances in farm produce. The rise in securities culminated late in September. It was followed by a 33 per cent reaction. Trade improvement, however, continued steadily, and was augmented largely by the enormous movement of freight to and from commercial centers, with attendant heavy railroad earnings. Through all this improvement prices of commodities, barring those of wheat, had developed no inflation, so that the situation from this standpoint is to-day on an exceedingly healthy basis. Toward the close of the year the iron and steel trade furnished evidence of a greater demand than ever before in their history, a substantial portion of which is of an export character. The country at the close of 1897 has still enormous quantities of produce to sell, an excellent market abroad, and, barring one or two lines, there are no surplus stocks, while in many instances supplies are below current requirements. Railroad earnings are larger than ever before when the aggregate is considered. There is prospect of currency legislation calculated to put the Nation's system on a stable basis, capital is seeking investment in securities and new enterprises, and the trade and financial outlook for 1898 is brighter than in any year for two decades.

The electrical industry has been prominent among those which have shown substantial improvement. This has taken the form of a material increase in business, but up to this time has not caused any important advance in prices. The gains have been substantial in that they are based on the general industrial improvement, and are of a character which would seem to warrant the assertion that they are likely to continue during all of 1898. When the panic swept the country there were numberless street railway, lighting and power enterprises on paper. Many of these possessed intrinsic merit, but owing to the distrust of capital and attendant tightness of money, not only were projected plans laid over, but many enterprises on which construction had been begun were suspended. The demand has continued to grow, and during the past six months there has been a very general movement to resuscitate various projects as well as the organization of new enterprises. This means an enormous business for the equipment and supply companies, considerable activity in financial circles, and it would not be surprising should a material advance in prices follow. Those manufacturing concerns which have weathered the storm are now in a position to profit to the maximum degree by the changed conditions, and it is fair to assume that all of the well known companies, as well as jobbers, dealers and others, will receive a share of the business.

The industry, as viewed from a business rather than technical standpoint, has developed along three of its principal lines; viz., railway equipment, lighting and power. The lighting business, which is regarded as a standard, while it has made substantial gains has not increased in the proportion to the railroad equipment and long-distance transmission branches. The latter, during the past six months, has become a very important factor. Street railway equipment is receiving increased attention at home as well as abroad. Domestic companies, since the middle of the year, have secured many important foreign equipment contracts. The most important domestic contract which has been placed during the period under review has been that for equipping the Metropolitan Street Railway Company's lines with the conduit system. It is impossible to give the terms of this in money value, as only the basis has been arrived at and such material furnished from time to time as is called for. An expert on these matters informs me that the understanding recently reached between the Third Avenue and Metropolitan companies, calculated to terminate all dissension, will lead to the equipment of every surface line in New York city with the electric conduit system. There are those who say that the deal is even wider in its scope, and that it will involve the construction and electrical equipment of an underground system and the third-rail equipment of the Manhattan Elevated.

In financial circles there has been a number of important deals consummated, although progress in this direction has not been nearly as great as that expected during 1898.

A few of the important measures may be summarized. I will not attempt to enumerate the formation of various corporations, the sale, absorption, etc., of smaller concerns, referring the reader to the news columns of the ELECTRICAL REVIEW. There are, however, a number of developments which have a general bearing on the industry.

One of the greatest changes of the year in the telegraph world was a consummation of the deal between the Commercial Cable and Postal Telegraph companies, the terms of which have been outlined heretofore in this column. In January the stockholders of the Edison Electric Illuminating Company of Brooklyn increased their capital stock $250,000 and bonds $500,000 for improvement and betterments. In May the Berliner patent was upheld as having been properly issued by the United States Supreme Court. In June the Western Union Telegraph Company listed $2,000,000 additional stock, making the total outstanding $97,370,000, to meet expense of new lines. In July the United States Court of Appeals decided the Van Depoele trolley patent to be invalid. In August $1,039,500 new treasury stock of the New England Telegraph and Telephone Company was issued. A month prior to this the company increased its dividend from a 5 to a 6 per cent basis. On October 13 the Sprague Electric Company was incorporated with capital of $5,000,000, one-half of which was 6 per cent preferred stock. On October 30 negotiations were opened between this company and the Interior Conduit and Insulation Company, which resulted in a transfer of the latter to the former, on terms which have heretofore been published in these columns. This is a very important and strongly backed company. In October the Erie Telegraph and Telephone Company issued $1,000,000 debenture bonds, the proceeds to be applied to the extension of the system. In November the announcement was made that a syndicate, including ex-Governor Flower, J. W. Hinckley, A. N. Brady and Perry Belmont, had purchased the Walker Company—another deal of great importance to the electrical field.

The tendency among electrical apparatus manufacturers during the year has been towards concentration. Business is in fewer hands than it was 12 months ago, and, judging from the signs manifest, there will be still greater concentration in 1898. The Westinghouse-General Electric pool is said to be operating satisfactorily, reports to the contrary notwithstanding. There has been a marked absence of important patent litigation that in the past has proved so expensive to the larger concerns. The pool mentioned above is largely responsible for this change; another cause is a general clearing up of issues involved.

The field is so broad that it would be impossible to give any comprehensive table showing the movement of prices of electrical securities in the limited space allotted. However, this matter is so important as indicating the movement of values that a dozen representative securities are selected, and the first price of the year, high and low and last quotations are appended:

Security.	First.	High.		Low.		Last.
Gen. Electric....	83	413/8	Sept.	285/8	May	341/4
" " pfd.	741/2	90	"	66	"	84
Western Union..	831/4	963/4	"	753/8	"	91
Am. Tel. & Cable.	90	137	"	851/2	Jan.	90*
Ed. El. Ill. of N. Y.	102	1321/2	"	1013/4	"	124*
" " Bklyn.. ..		1151/4	Aug.	97	Feb.	105*
Erie Telg. & Tel..	65	77	Sept.	681/2	April	721/2
Bell Telephone.	2051/2	285	"	2051/4	Jan.	2641/2
New Eng. Tel...	1011/2	135	"	101	April	128
El. Stor. Battery.	28	33	"	151/4	"	26
" " pfd.	301/4	363/8	"	171/4	"	29*
Ed. Il. N. Y. C'n. 5's	205	115	Dec.	1047/8	Jan.	115
Gen. El. Deb. 5's.	901/2	1021/2	Nov.	901/2	"	100*

*Bid.

BAIN.

New York, December 31, 1897.

The Montauk Multiphase Fire and Burglar Cable.

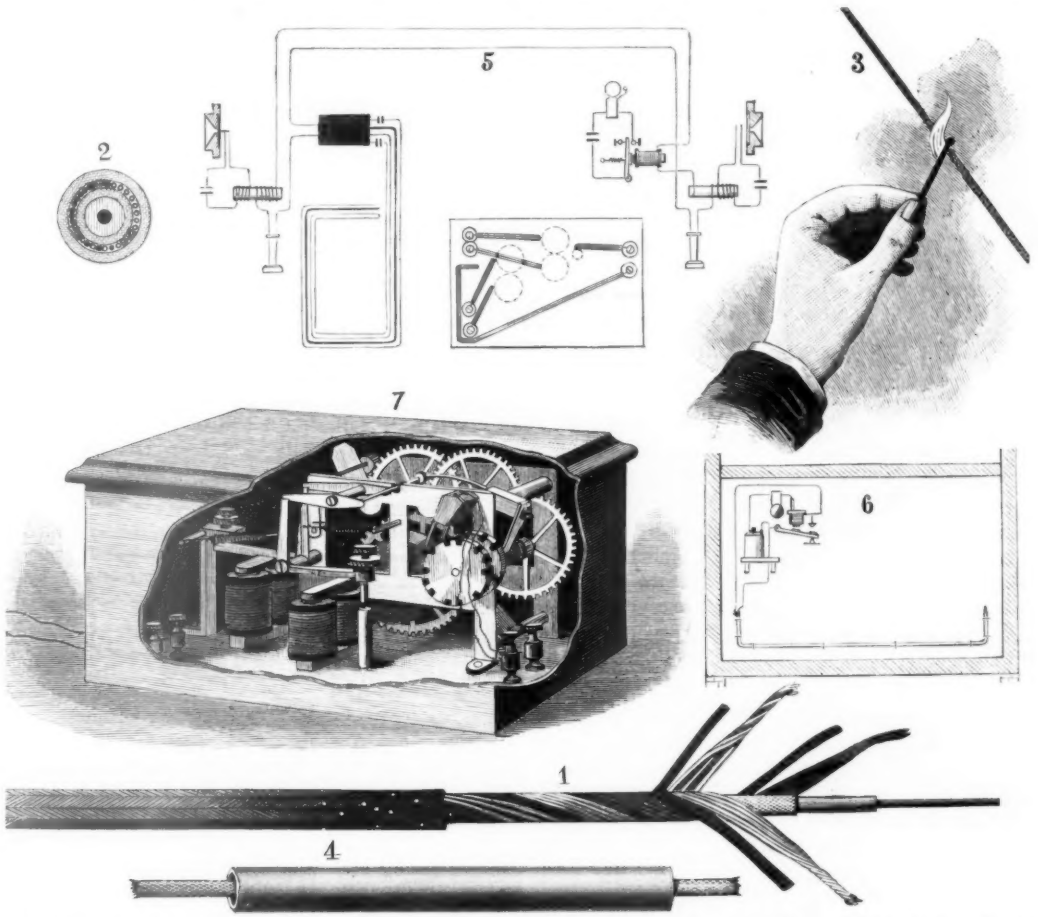
The Montauk Multiphase Cable Company, of 100 Broadway, New York city, have recently placed on the market an electric cable, which promises to be of great value in almost innumerable directions. In the accompanying illustrations the cable is shown in detail. The officers of the company are John D. Gould, president; C. W. Price, vice-president, and Charles A. Hanson, secretary and treasurer. These gentlemen, with Horace D. Brockway, form the executive committee of the company. Mr. Price, the vice-president, is a well known electrician, and was formerly superintendent of the B. & O. Telegraph Company, and was later connected with the Westinghouse interests.

The manufacturers of the Montauk multiphase cable state that it is not a competitor of any electrical interest, but it is designed as an auxiliary to all systems of fire and burglar protection now in use. The principal difference is that every infinitesimal part of the cable is alive to the approach of dangerous heat or flame and is capable of giving an automatic warning at any desired point. The breaking of the cable will perform the same service. The use of this cable to connect thermostats and other heat-detecting devices as well as burglar alarms is said to insure a perfection of protection heretofore unknown.

Referring to the illustrations herewith, Fig. 1 shows the cable, which is stranded on an inner copper wire coated with a metal that fuses at the low temperature of 374 degrees. It is stated that the fusible metal alone would carry the necessary current, but the copper is used to increase the conductivity. A suitable insulation is braided on the fusible metal coating, and over this is stranded a series of smaller wires, separated with insulations, as shown in the illustration. The cable is now covered with an outer protective wrapping. One of the outer wires may form a fire-alarm circuit, another a burglar-alarm circuit, another may be added for a servant's call, and still others may be used for a number of electrical purposes. Fig. 2 shows a cross section of the cable. In Fig. 3 is illustrated the fact that the cable may be fused with a lighted match. Fig. 4 shows the cable surrounded by a conduit for use on ships. A wiring diagram for a house fire-alarm system connected with the central fire station is shown in Fig. 5. Fig. 6 illustrates the method of wiring a room for fire alarm. When the circuit is automatically closed by an outbreak of fire the current operates the magnets in the controller, shown in Fig. 7, which act upon a system of levers and release a clock mechanism. This serves to rotate two controlling disks, which by means of make and break contacts ring up the call corresponding to the location of the fire and show the corresponding number on the annunciator. The disks are so arranged that they repeat the alarm at the central fire station.

The Montauk multiphase cable forms an effective burglar alarm, for if a burglar should attempt to cut the cable the pliers will form a metallic connection between the inner and outer wires of the cable and close the circuit, thus giving an alarm. To avoid any error in connecting up the return wires, they are made in different colors. The fire-alarm wires are of copper, another set are copper wires tinned, and a third set may consist of alternate tinned and copper wires. To reduce the bulk, each set consist of several fine wires whose aggregate cross section is sufficient to make up the required conductivity. In view of the many purposes for which this cable is designed, its bulk is extremely small, in fact small enough to be installed without attracting unusual attention.

Where this cable is used on shipboard, such as for detecting fire in coal bunkers, it is laid in a conduit which protects it from rough usage, and at the same time leaves it exposed to the action of heat. The Montauk Multiphase Cable Company own a number of patents covering the cable described above, and state that they are manufacturers only, and do not contract or install systems.



1.—The cable. 2.—Cross section of cable. 3.—Fusing cable with a lighted match. 4.—Cable in conduit for use on ships. 5.—Wiring for house fire-alarm connected with central fire station. 6.—Wiring of room and alarm connections.

DETAILS OF THE MONTAUK MULTIPHASE CABLE AND FIRE-ALARM SYSTEM.

Trolley Cars on the Brooklyn Bridge.

Considerable progress has been made during the past three or four days in the construction of the trolley tracks across the New York & Brooklyn Bridge. The trolley wire is all stretched, the bracket and hanger construction is almost finished, and most of the track has been laid. The first women to cross the bridge on a trolley car made the round trip last Sunday afternoon. They were the wife and sister-in-law of Francis S. Drake, the general superintendent of the Nassau Electric Railroad of Brooklyn. The party also included a number of officials of the road who came to the bridge in a special trolley car, but crossed to New York and back on the construction car, which has been used on the bridge to carry materials and workmen to and fro.

The first official trip across the bridge, by trolley, was made December 31, 1897, at 11 P. M., Mayor Wurster and railroad officials comprising the party.

Vallee Brothers & Company.

The co-partnership heretofore existing between Garrett A. Vallee, George W. Vallee and Hiram C. Roberts, trading as Vallee Brothers & Company, 625 Arch street, Philadelphia, Pa., was dissolved January 1, 1898, by mutual consent, Garrett A. Vallee and George W. Vallee having purchased the interest of Hiram C. Roberts, the retiring partner. The business of trading in all kinds of electrical supplies will be continued by Garrett A. Vallee and George W. Vallee, under the old firm name as heretofore, at the old address, 625 Arch street.

ROENTGEN-RAY NOTES.

BY WILLIAM ROLLINS.

X—SCATTERED ROENTGEN RAYS.

In a previous note I said the wave length depended on the potential and degree of exhaustion in the tube; a low potential and vacuum giving waves of such length as to make strong contrasts between bones and soft tissues in the human body; a high vacuum and potential giving less contrast, because the shorter waves generated went through the bones also. When we wished to see through greater thickness and yet have marked contrast, I recommended increasing the amperage, thus keeping the wave length unchanged, but increasing the amount of light, and stated that this did not much change the relative transparencies within the limits of an ordinary apparatus. It is the object of the present note to show why there is any change in the relative transparencies. In attempting to use ordinary light with one of my X-ray cameras, made to find stones in the bladder, I so enclosed a 20,000-candle-power arc that no light could escape into the room except through a small hole directed toward the abdomen. Though this light came through the tissues, it was too scattered to show structure, and this is naturally what happens with Roentgen rays, though in a less degree, because of their shorter wave length.

If we generate these waves of such a length as to lose all detail in the soft tissues we may still have the bones very dark by contrast. If we try to make the bones lighter by increasing the amperage, keeping the potential the same to prevent altering the wave length, we can make them very bright, if we have a big condenser and discharge it rapidly, but the brightness is due to scattered light and we do not see any more of their structure. If we want more details in the bones we must develop waves of shorter wave length, and when we have done this by increasing the potential and the vacuum we can make the bones as bright as before and yet see their structure, because the light is less scattered. Now, if we increase the amperage as before we make them still lighter and lose the structure, because we are using enough light to come through the denser parts, but being scattered light it shows no detail.

XI—MAKING THE COOLED ANODE OF OTHER METALS THAN PLATINUM.

In describing the A-W-L Roentgen-ray tube, I mentioned the cost of the platinum as a possible objection, and promised to describe a method of reducing the expense. In some experiments to determine what metal was best for that part of the anode receiving the cathode discharge, I used a brass anode, the only platinum being a short tube where it was sealed into the glass. As Kirmayer & Oelling, who make my tubes, find no difficulty in this construction, I see no present reason why it may not be employed. By soldering different metals to the end of these anodes, I have tried to determine which was best to use as a target in a reflecting focus tube. Tubes work so differently that it is difficult to compare them; and, to overcome this, I have arranged the metals to be tested around the periphery of an iron disk, which, being revolved by a magnet, enables me to bring any one quickly in position to receive the cathode discharge. Even then it is difficult to determine the relative values; but at present platinum seems well adapted to the purpose.

XII—BURNING FROM A VACUUM TUBE NOT GENERATING ROENTGEN RAYS. (TESLA'S SCREEN.)

Mr. Tesla long ago told us how to prevent burning, and, as his statements are always facts of nature, no proof is required to support them. I simply approach his fact from another point of view. I exhausted a tube to such a degree that no Roentgen light could be produced with the potential I employed, the discharge going around the tube. By exposing my hand it was severely burned. Yet, I have frequently exposed the same hand for 50 hours in a single month to a tube in which powerful Roentgen light was being generated, using the Tesla grounded aluminum screen, without producing any greater effect than slight redness and roughness of the skin. Cases of burning are not infrequent, and patients are nervous under examination, because they have known some one who has been burned. If a few physicians were su d for malpractice this would be immediately stopped, for there is no surer incentive to knowledge than to make ignorance and incredulity costly.

The Cleveland, Painesville & Eastern Railroad, a suburban electric railroad of Ohio, has been mortgaged to the Cleveland Trust Company and the State Trust Company, of New York, for $500,000, to cover an issue of bonds.

The Electrical Show in Madison Square Garden.

Interest in the next electrical show, to be held in Madison Square Garden, New York city, in May, 1898, has already gone beyond the electrical into the kindred trades, and is surprisingly strong in all branches of this great industry. Everybody remembers the splendid success of the show in 1896. Then it was held in a building, at that time comparatively unknown for such exhibition purposes, yet it attracted not only the trade, but great throngs of people from the territory within 100 miles of New York. The exhibitors themselves were paid many times over in business for the cost of their respective exhibits, and the best evidence of this fact is in the early demand from former exhibitors for increased allotments of space. Contracts are already in for more than one-half of the total space sold in 1896.

When it is remembered that the exhibition is four months away, and that at the last show, as is usual in such shows, more space was sold just before the opening of the show than in the several months before, it will readily be seen that late comers may be losers.

Electric railway manufacturers and dealers will get their first real good chance in the 1898 show to demonstrate what is being done in these lines. The changes in motive power now being made by street railways in and around the city, and interest taken in electric traction by short steam roads, will have a double effect; they suggest to the trade that the active demand for apparatus and supplies will bring to the show a great number of buyers. The second effect will be a stimulating of public interest in the new modes of generating and applying power to street railways. It is believed that the railway exhibit can be made, and no doubt will be made, one of the most attractive features of the show.

From interest already taken in it by the trade it is evident that the illustration of the various apparatus and supplies will be complete, varied and interesting, and public interest in these things will no doubt lead the daily press to give this feature of the show a great deal of notice.

When the management took a lease of Madison Square Garden it was thought to be rather a bold step. As the plans are now developing it is evident that so big a building is absolutely necessary. The advantage of location and building, the increase both in variety and number of exhibits will certainly draw a much larger crowd. There were over 300,000 admissions in 1896, and it seems reasonable to expect that the number will run up pretty close to the million mark in 1898. Other comparisons with the last show run in just as large a proportion. For instance, there was only one battery of boilers in operation at the 1896 exhibition. From the arrangements already made there will be at least three in the Madison Square Garden show. The engine and dynamo exhibits will also exceed the last show by about three to one. While the Garden is very much bigger than the last exhibition building the demand for space is even greater in proportion than the increase of space, and, of course, the walls of the Garden put an unyielding limit to the supply.

It seems proper to say a word about the generating exhibit. As the former show proved to be a feature of public as well as of trade interest, enough interested people found their way to it to make it profitable to the exhibitors. In Madison Square Garden not only the exhibit will be larger, more varied, more interesting, but it will be more accessible. There will be at least four entrances, from three sides of the building, and the care and skill in placing the exhibits, pointing out the features and properly advertising them, which made the last operative exhibit successful, ought to make this one at least four or five times as successful.

Benefit for a Disabled Conductor.

For the benefit of a conductor who had suffered an accident which endangered his earning ability, the Consolidated Electric Railway Company, of Santa Barbara, Cal., gave the gross receipts of its lines for one day while he was in hospital. His case appealed to his fellow workmen and the public, as he had been a faithful employé and was the sole support of his mother. The other employés of the company on the same day gave their day's earnings to him, and patrons of the road had conductors ring up sums ranging as high as $20. The car receipts amounted to $327.05.

A New Lighting Company.

The Commercial Light, Heat and Power Company, to operate in the territory of Greater New York, was incorporated on December 27, with a capital of $25,000, to manufacture and furnish electricity for public and private purposes. The directors are John E. McDonald and Robert L. Wooley, of New York city, and William H. Cushing, of Brooklyn.

When the Load Was Shifted.*

A young Cleveland man claims to have been placed in a very embarrassing predicament recently. He says he was calling on a certain young lady who resides in a fashionable downtown apartment house, and as she happened to have gone out with her mother, but was expected to return shortly, he said he would wait in their parlor. The servant ushered him in, and he was surprised to find that another caller was also waiting. It was a lady caller—a tall, somewhat angular person, of questionable age, with white gloves and a very large black hat.

Left alone with this lady, the young man felt a little uneasy. He hadn't contracted for a silent tête-à-tête with a lone female in a strange house. For a time he sat stiffly quiet. Then, as the silence grew oppressive, he arose and busied himself inspecting the pictures and bric-à-brac. As he moved along one side of the apartment, keeping at a safe distance from the stranger in the big hat, he happened to approach the electric button that controlled the light in the room. He had his eyes glued to a water-color hanging on the wall close by when, to his amazement, the lights suddenly went out, leaving the apartment in total darkness.

Of course, it was owing to an accident at the power house, but the young man didn't know that, and naturally expected the lights would immediately flash up again.

An instant after the eclipse set in there was a sharp gasp from the direction of the lady with the big hat.

"You—you did that a-purpose," she shrilly remarked. "I saw you standing by the button."

The young man wiped the perspiration from his brow.

"I assure you, madam," he said, "that I had nothing to do with it. It must be some—some lapse in the current or something."

"You did it," continued the shrill voice, "because you wanted to kiss me."

"No, no, madam!" cried the young man; "no, no! I wouldn't kiss you for the world."

Then, in his desire to escape, he started for the supposed location of the door.

"Don't move," cried the lady, "or I'll scream."

He halted for a moment, then softly crept along the wall again.

"I hear you," cried the lady. "Don't you dare to come near me."

"Madam," said the exasperated youth, "nobody wants to harm a hair of your head."

"That's just what the burglar said the night our house was robbed," moaned the lady.

"But I must find the door," said the youth. "We can't stay in here indefinitely in the dark."

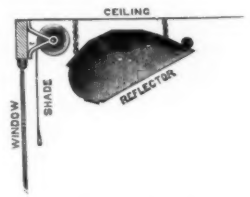


FIG. 3.—FRINK REFLECTOR, WITH CHAIN, FOR CEILING ATTACHMENT.

"I should think not," snapped the lady. "But don't you dare to come this way. If you do I'll stab your face with a hatpin! And don't you think you can fool me. I hear your miserable squeaky shoes every step you take."

"Perhaps," said the youth, for his sense of humor was beginning to return, "it would be well to take them off."

"Mercy, no!" cried the lady; "don't you dare to."

Then the youth felt his way forward, guided as to the lady's location by sundry sniffs and starts of alarm, and after he had run squarely into the mantel and banged against a screen and tumbled over a footstool and several chairs, he finally found the doorknob and bounced into the hall. It was pitch dark, but almost immediately he saw a servant coming up the stairs with a lamp.

"Show me the way out of this," said the youth, and the servant escorted him to the front door. As he stepped onto the sidewalk he drew a long and refreshing breath.

Col. Edward Morrell and H. V. Massey, of Philadelphia, are among the incorporators of the Monmouth Traction Company, which intends to build an electric railroad from Freehold to Keyport, N. J. It is ultimately intended to continue the road to Trenton, to connect with the present Philadelphia and Trenton line, and to put on a line of boats to New York from Keyport.

* From the Cleveland *Plain Dealer*.

Frink's Special Patent Window Reflector.

A well lighted show-window greatly increases its value for the display of the goods. To attain this end, I. P. Frink, 551 Pearl street, New York city, has brought out a special patent window reflector for use in connection with electric lights, which is shown in the accompanying illustration.

Fig. 1 shows the reflector, used with several electric lights placed across the window so as to throw the light down on the goods that may be displayed. The reflector is lined with silver-plated corrugated glass, and is arranged to be placed in top of window near the front glass, throwing the light inward and downward.

The reflectors are out of the way and concealed from view, and also conceal the direct light from the eyes of the observer, though a strong light is given down where it is wanted. By this means the display may be viewed without the annoyance of a dazzling light in the eyes. Among the many uses to which it may be put are the lighting of art galleries, pictures, stock exchange boards and places where a good light is desired.

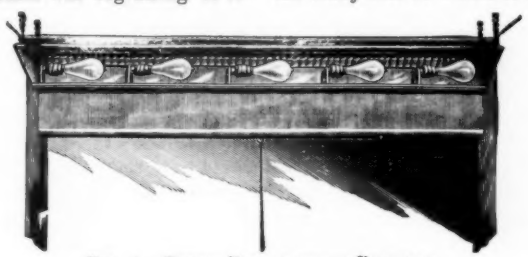


FIG. 1.—FRINK REFLECTOR IN POSITION.

Fig. 2 shows an end view of the reflector, arranged to be supported by a bracket attached to the transom of a window.

Fig. 3 shows the arrangement of loops and chains for suspending the reflector from ceiling. An eight-page circular devoted to Frink's reflectors, which gives full description, sizes and prices, can be secured on application.

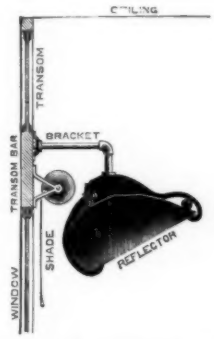


FIG. 2.—FRINK REFLECTOR FOR BRACKET ATTACHMENT.

OUR CANADIAN LETTER.

BROCKVILLE, ONT.—A rumor is current that steps will be taken in the Spring to build an electric railway.

HAMILTON, ONT.—A gentleman has made a proposition to the City Council to build an electric railway from Hamilton to Caledonia.

SHERBROOKE, QUE.—It is rumored that the Sherbrooke Street Railway Company will extend their line to Little Magog Lake next Summer.

BELLEVILLE, ONT.—An English syndicate is negotiating for the control of the Belleville Street Railway with a view of its extension to Tweeds.

LACHUTE, QUE.—The Atlantic & Lake Superior Railway, which owns the Lachute & St. Andrew's Railway, intends to convert it into an electric road and extend it to Carillon.

ST. THOMAS, ONT.—The by-law to confirm an agreement between the City Council and the Street Railway Company for the electrification of the street railway was carried by the ratepayers. The company agrees to build six and one-half miles of track and to strengthen the Wilson Bridge.

BOBEAYGEON, ONT.—Much interest is taken in the proposition to build an electric railway from Bobeaygeon to Peterboro. The proposition is to build a line to Scott's Mills, some 12 miles east, thence to Buckborn and Peterboro. This will avoid expensive bridges. The cost is estimated at $200,000.

WOODSTOCK, ONT.—We are informed that no company has been formed to build a railway from here to Ingersoll. The franchise for the town of Woodstock is held by the Woodstock Electric Light and Power and Street Railway Company, who have tried to interest parties in the building of the road, but so far with no success.

TORONTO, ONT.—Ritchie, Ludwig & Ballantyne, solicitors, give notice that application will be made at the next session of the legislature to incorporate the Toronto & York Radial Railway Company, with power to purchase the franchise and property of the Metropolitan Street Railway, Toronto Belt Line Railway, Toronto & Mimico Railway, and other roads within a radius of 100 miles of Toronto, and to construct steam or electric roads.

J. A. C.

Montreal, December 30.

THE HISTORY OF THE TELEPHONE.

INTERESTING REVIEW OF THE PIONEER WORK WITH BELL'S GREAT INVENTION.

BY GEO. C. MAYNARD.

[*Written especially for this number of the* ELECTRICAL REVIEW.]

When Bell, the inventor of the speaking telephone, was a lad of 12 years, his father, Professor Alexander Melville Bell, offered a prize to his boys if they would make a good talking machine. The youngsters enthusiastically set to work, and soon made a machine with a wooden frame, steel springs, cotton-batting cheeks and throat, india-rubber palate and tongue, which actually did talk. Shortly after it was completed, the boys placed it in the public stairway of the apartment house in which they lived, and set it crying with such naturalness and vigor that the occupants of the building rushed out to see whose baby was in distress. The elder Mr. Bell, and his father before him, were accomplished teachers of elocution and were thoroughly acquainted with all the qualities and functions of the human voice and the scientific principles involved. They had long made a special study of the needs of deaf persons and had been very successful in instructing them. Graham Bell (his intimate friends called him "Aleck") followed the family profession and was a proficient teacher. While engaged in teaching in England he constructed and equipped a needle telegraph line between his schoolroom and the residences of some of his pupils, and became much interested in its operation. Always a careful, thorough student and investigator, he at this time brought, side by side, the two lines of scientific research which a few years later were to join forces and revolutionize the world. About this time Bell's health became much impaired and the doctors gave him just six months to live. In this emergency his father decided to try a change of climate and environment and took him to Canada. Just before leaving England young Bell determined to live (or die working), secured a copy of Helmholtz's accounts of his experiments in "Electricity and Acoustics" (then just published in French), and sailed with the book in his pocket. With the change from English fogs to ocean gales, and the invigorating tonic of the Canadian atmosphere, health returned, opportunities for investigation enlarged, enthusiastic determination to master the subject increased. Across the river the flag of the Republic beckoned to greater liberty for the exercise of all his desires. In no other country than the United States could the inventor have found such opportunity, encouragement, protection.

Bell started out with the erroneous idea that sound could be transmitted by wires. Inquiry showed him his mistake; long and patient investigation led him to the discovery of the principles which made the transmission of speech possible. The details of these inventions and experiments supply material for a story of thrilling interest. The first magneto telephones, exhibited in 1876, were marvelous for their clearness of speech. None made since that time have exceeded them in this quality, and attempts to make them talk louder have generally resulted in indistinctness. Lord Kelvin (then Sir Wm. Thomson) described the invention as "Alexander Bell's apparatus, by which he has achieved a result of transcendent interest—the transmission of spoken words by electric currents through a telegraph wire. This is, perhaps, the greatest marvel hitherto achieved by the electric telegraph."

In the introduction of the Bell telephone, Gardiner G. Hubbard had entire management of the business. For nearly a year the headquarters of the company was in Washington, and from that day to the time of his death, three weeks ago, Mr. Hubbard's judgment and counsel were important factors in the conduct of the business. The first interest in the new invention was shown by scientific men, and most of them had no conception of its practical possibilities. Applications came from college professors and high-school teachers who regarded it simply as a curiosity which might be used to interest their classes and bring notoriety to their educational establishments. For this purpose Mr. Hubbard lent instruments to numbers of such institutions in distant parts of the country. The writer carried a pair of telephones to the Smithsonian Institution and held a half-hour's conversation with Prof. Joseph Henry, who, as he comprehended the operation of the apparatus, repeatedly ejaculated, "Marvelous, marvelous!" The idea of any commercial utility did not enter his mind. In this peculiarity, scientific men were not alone. The president of the Western Union Telegraph Company visited Washington to investigate the telephone, and after exhaustive and deliberate examination, emphatically declared it could *never* be of any practical use. Jay Gould, who was induced by a friend to make the trip from New York to Washington, spent a long time in examining and testing the telephone, made no comments and went away. He had every opportunity to secure large interests in the invention for almost nothing, but regarded it as a humbug and let the opportunity slip. His example was followed by nearly everybody else.

Scarcely anybody could be induced to use the telephone for business purposes. Lines were constructed and instruments put in operation without charge, the record showing that they were put out "on trial." The people and not the telephones were on trial. The education of patrons in the use of the telephones was the most difficult feature in the business. Improper use of the instruments was universal, and it required the constant services of an inspector to go about and turn over the diaphragms of the telephones, which had been punched out of shape by the pencils of persons trying to find out how they worked. Users of the telephone would talk too loud, and the longer the line the louder they shouted. General Myer, first chief of the Weather Bureau, was trying to hold a conversation over a line leading to Arlington Heights, across the Potomac, when Captain Howgate suggested that if he would leave the telephone and put his head out of the window they would hear him better.

The telephones, from the first, were the most satisfactory pieces of apparatus in the equipment of a line. The difficulty of making a reliable telephone cord seemed insurmountable, and the early magneto bells were about as effective, and not half so reliable, as a coffee-mill. Charles Williams, in Boston; Davis & Watts, in Baltimore, and Post & Company, in Cincinnati, made many poor bells before they could produce a good one. E. T. Gilliland was engaged by the latter to design their instruments, and he put them on the road to success, but the company was obliged to dismiss Gilliland because his inventive genius was so active that they could never get one bell on the market before he would produce a better one.

In the first stage of the business, telephone men found it most difficult to induce business men to try the telephone; in the second, it was impossible to keep up with the demand for lines. This was especially true in starting exchanges.

The following are the names of a few of the men engaged in the pioneer work: George W. Coy, New Haven; Charles J. Glidden, Lowell; W. D. Sargent, Philadelphia; W. C. Humstone, New York; E. T. Gilliland, Indianapolis; T. B. Doolittle, Bridgeport, Ct.; George C. Maynard, Washington, D. C.; C. N. Fay, Chicago; George W. Balch, Detroit; W. H. Eckert, Cincinnati; A. G. Davis, Baltimore; C. H. Haskins, Milwaukee.

These agents received a confidential circular, signed by T. A. Watson, superintendent Bell Telephone Company, giving explicit directions for the construction and operation of a telephonic exchange system. A single-stroke electric call-bell in each subscriber's office, and a separate bell and signal key for each circuit entering the central office, were the characteristic features of the system. The charges to subscribers were to be from $1.50 per month to $50 per annum.

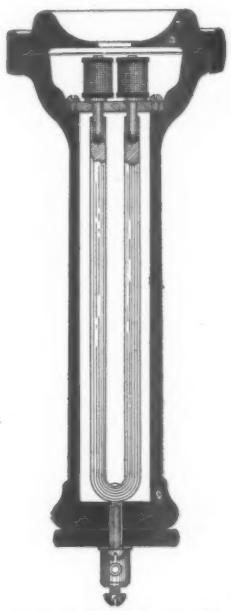
In order to fully prepare financial investors in local telephone companies for the enterprise in which they were embarking, Superintendent Watson gave out the information that one operator, at a salary of $5 to $10 per week, could run the exchange, and that "the capital required to start this system, with 150 or 200 subscribers, with 20 miles of wire, need not exceed $2,000."

In the organization of exchanges the amount of Watson's estimate was soon exhausted, and much larger sums were raised and speedily absorbed as the business grew to undreamed of proportions. In carrying on the exchange service a thousand problems were met and had to be solved. Much help in these matters was gained by consultation and cooperation of the managers of local companies, and in September, 1880, a large number of representatives met at Niagara Falls and held a four days' convention. The National Telephone Exchange Association was organized, with Geo. L. Phillips, of Dayton, president; H. H. Eldred, of St. Louis, vice-president, and M. F. Tyler, of New Haven, secretary.

The object of the organization was to promote various matters of business in which the local telephone companies were mutually interested. At this first convention, the underlying motive for united action was based on the belief that unjust measures of the parent telephone com-

pany would have to be resisted. O. E. Malden appeared as the spokesman of the Bell company, and was subjected to a lively questioning by the members of the convention.

The literature of the early telephonic days contains some interesting items. A book written by Edward H. Johnson, and published in 1877, now unfortunately out of print, refers to Bell's telephone as "an instrument of considerable practical value, but of somewhat limited capacity * * * an extraordinary sensitive invention, like a sensitive



THE PHŒNIX DOUBLE-POLE TELEPHONE RECEIVER.

woman, better fitted to adorn the parlor than to cope with the rougher elements of a practical sphere, and while it may, and certainly will, prove practical upon short isolated wires in quiet nooks, for lines of any considerable length or the busy marts of trade, we are compelled to still look ahead for a thoroughly practical instrument." Thus looking ahead, Mr. Johnson discovered his associate, Mr. Edison, "whose modesty acts as a screen to hide him from public gaze," and brought him forward to undertake the "herculean task." Edison, "after exhausting every possible device which a wonderful, fertile brain could devise, became satisfied he must enter the field of original investigation. Nothing daunted, he compelled reluctant Nature to yield to deliberate assault and provide from her wonderful storehouse, a principle new to the scientific world."

In the same year Mr. Dolbear published a treatise on physics, apparently for the purpose of stating in the preface "the speaking-telephone, in which magneto-electric currents were utilized for the transmission of speed and other kinds of sounds, was invented by me."

The Phœnix Double-Pole Telephone Receiver.

As competition in the telephone field becomes more and more active, the manufacturers are paying more attention to improving and perfecting minor details, which some time ago were often considered "good enough." A notable instance of this fact is found in the double-pole receiver just placed upon the market by the Phœnix Telephone and Manufacturing Company, Chicago. The illustration herewith shows in sectional view the construction and arrangement of the parts, whereby not only more powerful results are obtained, but the distance between diaphragm and poles is kept constant, preventing the telephone from getting "weaker" or "stronger" as the temperature changes. The workmanship is of the best and fully up to the high standard for which all the Phœnix apparatus is noted.

Locke's High-Potential Insulating Specialties.

Fred M. Locke, of Victor, N. Y., well known as a manufacturer of insulating specialties for high-potential currents, has recently placed on the market a number of new devices, of which several are illustrated herewith. In Fig. 1 is shown a triple petticoat glass insulator designed for use on electric transmission lines carrying potentials up to 20,000 volts.

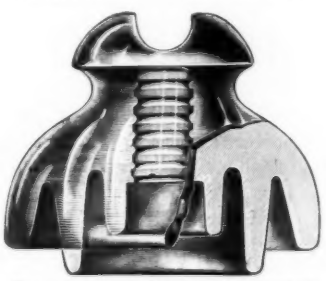


FIG. 1.—LOCKE'S TRIPLE-PETTICOAT GLASS INSULATOR.

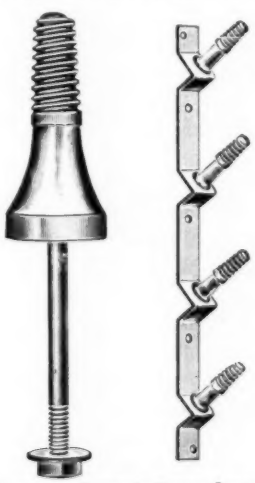
In Fig. 2 is shown a steel insulator pin equipped with a porcelain ball. These pins are being extensively used in all parts of the country. Fig. 3 illustrates a galvanized upright side bracket for attaching high-capacity insulators to the sides of buildings and other similar places. They are made in a number of convenient sizes.

The National Association of Manufacturers.

It is definitely settled that President McKinley will attend the banquet of the National Association of Manufacturers, to be given at the Waldorf-Astoria, Thursday night, January 27. A committee consisting of Warner Miller, Charles A. Moore, Charles A. Schieren, William Brookfield, Benjamin Atha, Henry B. Haigh and Charles E. Locke, by appointment called at the White House, last week, when the President listened to the request of the committee, and, after asking many questions regarding the work and national character of the association, indicated that he would endeavor to attend and speak on the occasion. He asked the committee to call again at half past two next day, when he would give his final decision.

Promptly at the hour named the committee waited upon the President, and were greatly pleased when he stated that he had decided to accept the invitation, and assured the committee that he not only felt it to be a duty, but that it would be a great pleasure to him to meet with manufacturers representing all lines of industry and from all sections of the Union, at their annual convention.

It is understood that Senator Frye has also consented to speak. The committee hopes to be able to make a full report to the convention execu-



FIGS. 2 AND 3.—LOCKE'S STEEL INSULATOR PIN AND UPRIGHT SIDE BRACKET.

tive committee as to the names of other speakers within the next few days.

The St. Louis & Belleville Electric Railway Company, Ill., has voted to increase its capital stock from $50,000 to $500,000 and to issue bonds to build a double-track railroad between Belleville and East St. Louis.

Novel Cabinet Desk Telephone.

The Western Telephone Construction Company recently had occasion to supply a number of specially designed desk sets to a customer who wanted transmitter, receiver and magneto all combined in one and still have the set portable and not too bulky. How well it succeeded is shown by the accompanying engraving, which illustrates the set neatly mounted in a polished oak case. The transmitter arm has an adjustable

A NOVEL CABINET DESK TELEPHONE.

joint so that it can be quickly adjusted to any desired position, while the entire set is so compact and convenient as to undoubtedly create a great demand for itself.

Electrically Protected Hens.

A press dispatch from Newburg, N. Y., states that electricity has been put to a new use at the hennery of William B. Beakes in that city. On a recent morning an unknown man was found unconscious and almost frozen at the door of the hennery. William B. Beakes, Jr., who is something of an electrician, had charged the knob on the door with electricity. When the man took hold of the knob he received a shock which rendered him unconscious. When restored, he said he had been looking for shelter for the night, but knew nothing more after touching the knob.

Armington & Sims Engine-Shop in Providence Sold.

The Armington & Sims engine-building plant was sold under the hammer last week to James M. Scott. The price was $40,000 over and above a mortgage of $80,000. The sale was made by order of the creditors' committee. Scott made the purchase for some person unknown.

A Roentgen Society in New York.

TO THE EDITOR OF ELECTRICAL REVIEW:

A Roentgen Society would be a go in New York city. F. MARTIN.

New York, December 29.

ADVANCE INFORMATION

Electric Light and Power.

PITTSBURGH, PA.—A $25,000 electric light plant is to be placed in the Government building at this place. Work will be commenced on it early in the new year.

SALEM, N. Y.—The Salem Electric Light and Power Company has been incorporated; capital, $10,000; directors, Edgar W. Philo, Jas. H. Houghton and others of Salem.

COLORADO SPRINGS, COLO.—The Labella Mill, Water and Power Company has been incorporated. The incorporators and directors are Sil T. Smith, Eben Smith and R. H. Reid. The capital stock is $250,000. The purpose of the company is to construct a mammoth reservoir on Wilson Creek, which will supply water-power to run mills and electrical machinery, etc., throughout the Cripple Creek district.

TELLURIDE, COLO.—T. C. Dobbins and S. A. Bailey, of this place, have secured a franchise from the town of Delta, and will immediately begin the work of putting in an electric light plant.

TULLAHOMA, TENN.—The Carson & Barnes Manufacturing Company contemplate fitting up their establishment with electric light facilities.

BIRMINGHAM, ALA.—The Mayor may be addressed concerning erection of electric light plant.

DOUGLASVILLE, GA.—F. Lederlee, engineer, Atlanta, Ga., may be addressed concerning construction of electric light plant.

GAINESVILLE, FLA.—City Clerk may give information concerning erection of lighting plant.

FERNANDINA, FLA.—The Electric Supply and Construction Company has been awarded a contract for construction of electric light plant.

PONTIAC, MICH.—The electric light plant in this city has been sold to the Medbury Gas Company, of Detroit.

SULPHUR, KY.—F. W. McIlvane may give information concerning establishment of electric light plant.

SOMERSET, KY.—Beecher Smith has been granted franchise for erecting an electric light plant.

MOULTRIE, GA.—A. Huber may give information concerning establishment of electric light plant.

ALBANY, N. Y.—The Board of Supervisors may give information concerning proposed establishment of electric light plant in State Armory.

MARIETTA, PA.—The Pennsylvania Electric Company has been capitalized at $25,000.

NICHOLASVILLE, KY.—The Mayor and Councilmen of this place are negotiating with electric light parties with a view to putting in a plant here.

JOHNSTOWN, N. Y.—The Johnstown Electric Light and Power Company has added to its plant a large dynamo, made in the factory of the General Electric Company, at Lynn, Mass.

UNIONTOWN, KY.—The Uniontown electric light plant has been sold to J. N. Broadus.

FOWLER, IND.—A new electric light plant will be built here by local capitalists. Banker Dinwiddie, Daniels & Cones, George A. Matthews, Eller & Owings, George Bates, the Hon. Grant Hall, Harry Rank, John Barnard and Wallace Evans are interested. The plant will cost $15,000, and will have all the latest improvements. It will be in operation by February 1, 1898.

MINNEAPOLIS, MINN.—Plans are being made by City Electrician Pillsbury for the improvements in the electric light plant at the North Minneapolis pumping station.

New Electric Railways.

MASSILLON, OHIO—The right of way is being secured for an electric railroad to connect this place with Dalton, Ohio. The electric road from Cleveland to Wooster is practically certain to be built next Summer.

WATERTOWN, N. Y.—Watertown & Brownville Street Railway Company has been incorporated; capital, $65,000.

RAVENNA, OHIO—The Osborn-Kimball Engineering Company, of Cleveland, have asked the County Commissioners for a street railway franchise through Portage County to connect with the A. B. C. line.

PITTSBURGH, PA.—It is reported from New Castle that a company has been formed to build a new electric line to extend from the Pittsburgh and Lake Erie and the Pennsylvania lines in the Beaver Valley up past the Rock Point picnic grounds to Ellwood City and Hazel Dell.

ELKHART, IND.—The Elkhart, Goshen & Southern Electric Railway, to run from this place to Lake Wawasee, has been incorporated with a capital of $250,000. The directors are W. H. Holcomb, of Chicago; H. D. Judson and N. J. Aldrich, of Aurora, Ill.

LANSING, MICH.—A new electric railroad will be constructed between this place and Dexter.

ROCKFORD, ILL.—The Rock River Electric Railway Company, which proposes to construct a line from Rockford to Dixon, has been organized.

MIDDLETOWN, N. Y.—W. D. Stratton and A. S. Drake, of this place, have contracted to build a five-mile surface electric road at Southfield, Staten Island.

NEWPORT, R. I.—The Middletown & Portsmouth Railway Company have been granted a franchise by the Middletown Town Council, to connect this city and Fall River by trolley system.

SISTERSVILLE, W. VA.—The Sistersville & Salem Railroad Company has been chartered to build an electric road from Sistersville, on the Ohio River, to Salem, Harrison County, by way of Middlebourne.

QUINCY, ILL.—J. C. Hubinger, of Keokuk, and several Quincy capitalists propose to build an electric railway from this city through Calhoun County.

New Telephone and Telegraph Companies.

SWANBORO, VA.—The Bell Telephone Company has been granted permission to construct a line of poles from Jones's store in this place, to Charles Stein's place in the county.

JACKSONVILLE, FLA.—The East Texas Telephone Company has been incorporated; capital stock, $2,000; purpose, construction and operation of a telephone exchange and telephone line from Tyler to Shreveport, La., via Jacksonville, Rusk, Alto, Lufkin and Nacogdoches, with branch lines from Jacksonville to Henderson, and from Jacksonville to Palestine. Incorporators: W. H. Sory, of Jacksonville, and C. M. Pittman, of Nacogdoches.

BATAVIA, N. Y.—The Bell Telephone Company has completed its telephone line from this place to Albion, and the line has been opened for use.

MANSFIELD, OHIO—The local long-distance telephone line between this place and Bucyrus is almost completed.

HAVANA, ILL.—The Mason County Telephone Company has been incorporated; capital, $8,000; incorporators, A. F. Terrill, Carl P. Fetzing, D. W. Wright.

MCDANIELS, KY.—The telephone line from this place, Breckinridge County, via West View to Hardinsburg, is completed.

STEUBEN, N. Y.—The Steuben & Ontario Telephone Company has been organized. The line will connect Atlanta, North Cohocton and Naples, via Ingleside. H. W. Blake, president; W. G. Porter, secretary; W. H. Housel, treasurer.

BALTIMORE, MD.—The Hall Telephone Company has been incorporated. James A. Hall, president and treasurer, and James W. Broughton, vice-president. The company will establish telephone lines throughout the northern part of the country, connecting every town and village in that section, and extending as far south as Accomac Court House, where it will connect with the existing line between that place and Onancock. Another company has been organized, which will cover the southern part of the county with wires.

New Incorporations.

MARIETTA, PA.—The Pennsylvania Electric Company, to manufacture electrical and electro-mechanical appliances, has been incorporated. The capital is $2,500, and the directors are H. Burd Cassell, H. L. Haldeman, E. L. Reinhold, E. B. Reinhold and H. S. Rich, Marietta; E. H. Hershey, Gordonville, and J. H. Myers, Bainbridge.

BUFFALO, N. Y.—Globe Medical Electric Company, capital $2,400, has been incorporated.

PORTLAND, ME.—Shipton Electric Light and Power Company has been organized, for the purpose of manufacturing, generating and distributing electricity, with $150,000 capital stock. The officers are: President, Edgar E. Rounds, of Portland; treasurer, C. L. Buckman, of Portland.

Increase of Capital.

CHATHAM, N. Y.—The Chatham Electric Light, Heat and Power Company has increased its capital from $10,000 to $30,000.

MEMPHIS, TENN.—The Memphis Light and Power Company has increased its capital stock from $150,000 to $300,000.

Kindred.... ...Interests

J. P. Williams, of 39 Cortlandt street, New York city, has prepared a very unique calendar for 1898. It is a fac-simile of his electric fan, having three months on each blade.

The Direct United States Cable Company has sent to the ELECTRICAL REVIEW a well prepared and convenient pad calendar, carrying with it the slogan, "Mark your cablegrams '*via* Direct Cable.'"

The American Rheostat Company, Milwaukee, Wis., have opened a Chicago office at 1104, the Rookery, with a full and complete line of rheostats for all purposes, the George Cutter Company being the agents.

"We Light the World" is the convincing motto prominently and artistically exemplified in a handsome calendar issued by McKenney & Waterbury, 181 Franklin street, Boston, Mass., who are well known manufacturers of gas, electric and oil fixtures.

The American Electrical Works, Providence, R. I., has sent to its friends a beautifully executed calendar, showing its extensive works and main offices at Phillipsdale, R. I. The color work is really artistic, and the calendar will undoubtedly receive a cordial welcome wherever it goes.

Mr. A. H. Mustard, New York, sales agent for the Helios Electric Company, of Philadelphia, has established offices at 203 Havemeyer Building, New York city, where a full line of Helios enclosed arc lamps are carried in stock for prompt delivery. Mr. Mustard's telephone call is 1391 Cortlandt.

The California Asphalt Company, of 57 East Fifty-ninth street, New York city, who are manufacturing the well known Alcatraz electrical compound, have changed their name to the Atlantic Alcatraz Asphalt Company. They report a large sale of their Alcatraz asphalt paint used for metal coating.

A recent short-circuit test, made on the new Standard dry battery, manufactured by Mr. M. Roche, of 259 Greenwich street, New York city, showed nine and one-half amperes. Mr. Roche claims that the battery he is now making will last as long as any other dry battery of its size on the market at the present time.

The Standard Lamp Company, of Marion, Ind., has added an entirely new plant to its factory. The company is now equipped with the latest improvements and appliances for making high-grade incandescent lamps. The capacity of the factory is 12,000 lamps per day, which can be increased to any reasonable extent. The Standard Lamp Company makes its own carbon.

The Riverside Worsted Mill, of Providence, R. I., are making some extensive improvements in their plant. Among them is the rebuilding of the boiler house, which is being constructed so as to have it absolutely fireproof. The walls are of brick, and the roof will have metal supports, with a tile roofing. The contract for furnishing and erecting the iron work has been given to the Berlin Iron Bridge Company, of East Berlin, Ct.

The Electric Appliance Company, Chicago, report that their new issue of General Catalogue No. 12 is now very generally distributed all over the country, and is producing very satisfactory results. Certainly very few buyers could resist the temptation of ordering from such a handsome and useful publication. The Electric Appliance Company are entitled to all the good that their catalogue may bring them, as its production involved a great amount of work and expense.

Geo. W. Patterson has recently been appointed western representative in charge of the office of the American Circular Loom Company, at 1114 Marquette Building, Chicago. Mr. Patterson is known to the trade through his connections as western agent for the Gordon-Burnham and Law primary and Ohio storage batteries, and Medbery knife-switches and overhead railway material, which companies he will still represent. Mr. Patterson reports business good for the season, but regrets it is not fashionable to make Christmas presents of anything in his line. However, the demand still continues for his business card showing "Periods When to Make Money."

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Times Building, New York.

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The increasing popularity of the Gordon Primary Cell among the Fire Alarm and Police Signal Service of the leading cities, the railroad, telegraph and telephone companies, and the general adoption of our steel enameled cell for gas-engine, launch and marine service attest most highly to its merit, efficiency, adaptability and economic features.
If you wish to read the testimonials in its behalf, and learn its full description, kindly apply for circular and price-list, to
GORDON-BURNHAM BATTERY CO.,
32 to 36 WEST BROADWAY, NEW YORK CITY.

POSITION WANTED—with Telephone Company by young electrician, aged twenty, with good business education, and two years' experience in all branches of telephone work, and considerable experience in electric light wiring, etc. Will do all kinds electric work; experienced in line work. Would like to take charge of work of independent exchange. Address "20," care ELECTRICAL REVIEW, Times Building, New York.

HELP WANTED—MALE

Northern Pacific & Alaska Mining, Transportation & Trading Company, owning thirty-five valuable quartz veins, and nearly a thousand acres of placers in richest Alaskan gold fields, will run steamers from Seattle and San Francisco to Snug Harbor, Cook's Inlet (where will be established a great commercial depot) and connect with only feasible rail route to Yukon, Klondike and Copper River Districts. Offers to investors unique proposition. Correspondence with first-class local or traveling salesman desired. Address (with reference) at Equitable Building, New York.

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MANHATTAN ELECTRICAL SUPPLY COMPANY,
32 Cortlandt Street, New York.

Electrical.... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED DECEMBER 28, 1897.

596,054 Electric railway; E. C. Crocker, Bridgeport, Ct.

596,075 Eccentric; R. Marvin, Findley, Ohio.

596,085 Electrical signal bell for street cars; J. P. Orr, Pittsburgh, Pa.

596,131 Trolley: A. Travaglini, Philadelphia, Pa.—In combination with a trolley pole, a trolley wheel carried thereby, a fin adapted to be brought into vertical alignment with the wheel, or removed therefrom, and means for automatically operating the fin.

596,134 Signaling circuit for fire and police station systems; Albert Barret, Kansas City, Mo.

596,136 Armature winding and coil; A. F. Batchelder, Schenectady, N. Y.—A coil for a dynamo-electric armature, having the sides to be disposed on the armature face united at least at one end by three end portions, two of which are involutes offset from one another, and the third a spiral.

596,135 Securing device for covers of dynamo-electric machines; N. C. Bassett, Lynn, Mass.

596,152 Detachable laminated pole-piece for dynamo-electric machines; H. Geisenhoner, Schenectady, N. Y.

(To be continued.)

SOME SPECIAL ADVERTISERS.

In the ELECTRICAL REVIEW this week a number of special pages from its advertisers are presented. These came without any special solicitation, resulting from the announcement sent out that we should change the form of the ELECTRICAL REVIEW with its first issue in January. Knowing that any improvements made in this journal as it enters its sixteenth year would attract attention, these progressive patrons promptly notified us of their desire to be represented, and we take pleasure in specially mentioning their announcements:

The Jandus Electric Company, of Cleveland, Ohio, calls attention to its double-enclosed arc lamps, mentions their very extensive use, and presents illustrations of four handsome and serviceable designs. This page is on the inside front cover.

The Central Electric Company, of Chicago, ever artistic and effective, presents a view of a well filled crib of corn labeled "1898," which is attracting the attention of the chanticleer and his fowl companions, and to which the cupid farmer's son is pointing with pride. This announcement is on page iv.

The Okonite Company, Limited, sends "greetings" and epigrammatically makes a few pointed statements of interest to users of insulated wires. The unmistakable trade-mark and the Paris and Chicago medals are also shown. Page v.

The Columbia Lamp Company, of St. Louis, presents the claims of the Columbia incandescent lamp in a well written and well displayed announcement. The high quality of these lamps is very properly alluded to, and the maintenance of candle-power given as proof of the excellent vacuum. Page vi.

The New England Engineering Company, Waterbury, Ct. (see inside back cover), mentions with commendable pride its record in the building of electric light and power stations as well as in the remodeling and modernizing of old stations. Their reference is the large number of plants installed.

The Safety Insulated Wire and Cable Company, of New York, whose page is to be seen in the vicinity of the telephone announcements, page xxii, calls attention to a sextuple array of big street railway contracts, and invites all users of rubber-covered wires to communicate with it for lists and catalogue.

The Eddy Electric Manufacturing Company, of Windsor, Ct., announces, on page vii, that the Eddy motors and dynamos are not an experiment. Like the ELECTRICAL REVIEW, these motors have been made for 16 years, and continue to grow in popularity.

The General Electric Company presents a fac-simile of the front of its new incandescent lamp catalogue, a striking and effective page. This catalogue will be much sought for by all lamp users. Page xi.

The Monarch Manufacturing Company speaks of its "safe, swift, sure" engine stop and speed-limit. The indispensable nature of this important invention to all electric light and power stations is pointed out. A descriptive catalogue, just out, will be sent to all who write to the company at Waterbury, Ct. Page x.

The American Electric Telephone Company, of Chicago, presents a view of a very striking telephone switchboard, and a fac-simile of the medal granted to it for the extensive exhibit made at the Nashville exposition. The excellent telephone apparatus made by this company is very naturally mentioned. Page xvii.

The Montauk Multiphase Cable Company announces its interesting cable as "born with the Greater New York." A striking illustration, and description and list of patents are given. Page xix.

Partrick, Carter & Wilkins announce the change of name of Partrick & Carter Company to the new name. The dates 1867–1898 (the good age of 31 years) conspicuously appear. Page ix.

The Fort Wayne Electric Corporation advertises the Wood apparatus for light and power in a conspicuous cut. A list of its many branch offices go to make up a very handsome page. Page xviii.

WESTERN NOTES.

Mr. Harry L. Ide, builder of the well known Ide and Ideal engines, came up to Chicago from Springfield last week to look after some large contracts in hand by the Chicago office.

Mr. Max A. Berg, of the Ohio Brass Company, Mansfield, Ohio, spent a few days in Chicago last week on business and pleasure combined. Mr. Berg, though still a young man, is one of the old timers in the supply business and will be favorably remembered from his connection with the Electrical Supply Company, and later with the Wallace Electric Company, of Chicago.

The Stromberg-Carlson Telephone Manufacturing Company, of Chicago, is closing the old year with a greater number of orders on its books than ever before and is in better position than ever to fill them. The greater part of the orders consists of full exchange equipments, running as high as 400 to 500 line capacity. This speaks well for the high quality of the company's apparatus, and it is no rare occurrence for the firm to secure a contract in the face of the strongest competition.

A striking illustration of the value of persistent and judicious advertising is found in the case of the Farr Telephone Construction and Supply Company, Chicago. Beginning a couple of years ago in a small way, it started to systematically advertise its goods in several of the more prominent electrical and kindred journals; as the business grew, the ads. were also increased in size and number, which naturally resulted in bringing still more business, until to-day it finds it absolutely necessary to seek larger quarters in order to properly take care of the business. With the new year the company will move across the street into the Ellsworth Building, where it will occupy the entire first floor, containing over double the space occupied formerly.

Change of Firm Name.

The undersigned, heretofore trading under the name and style of **Partrick & Carter Co.**, have this day changed their firm name to **PARTRICK, CARTER & WILKINS.**

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CHARLES M. WILKINS.
E. WARD WILKINS.

Philadelphia, Jan'y 1, 1898.

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REFERENCES: "Electrical Review," New York; Paul Cromlein, Teller Lincoln National Bank, Washington, D. C.; Judge Geo. D. Parker, Berkley, Va.; Second National Bank, Washington, D. C.; E. K. Leech, U. S. Mint, Philadelphia, Pa.; W. F. Newell, Manager and Secretary Water Works, Olympia, Oregon.

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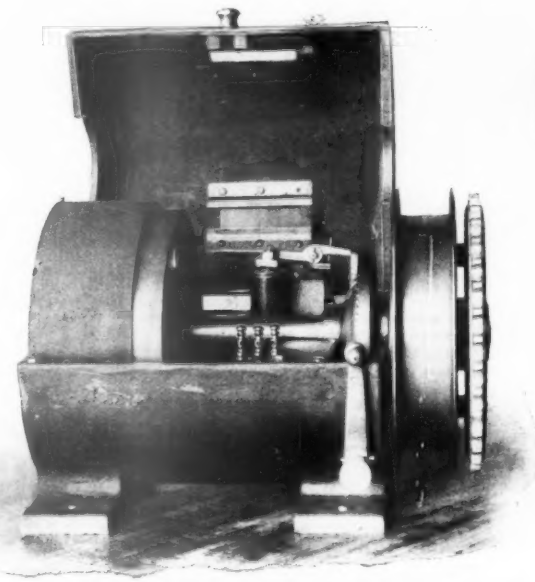

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WE CLOSE THE THROTTLE

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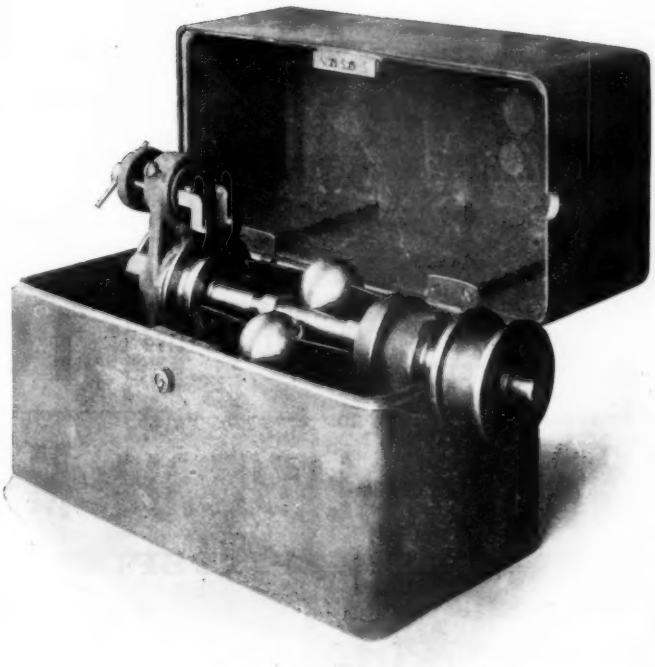

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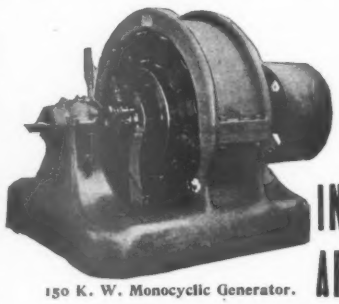

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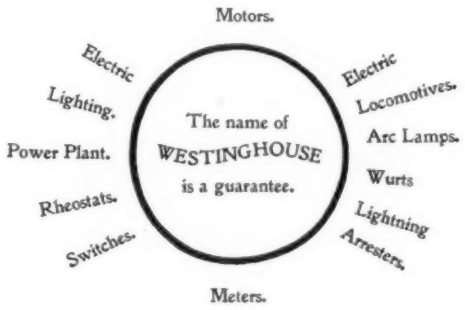

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⅞	15.04	138.12	155.03	223.61	84 55
¾	15.11	127.67	133.24	191.06	83.68
⅝	15.88	131.50	112.65	162.80	80 25
½	16.47	126.87	90.04	127.73	75.95

Test of a 35 inch SAMSON, Feb.1,'97.

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Full	15.29	194 25	102.02	143.44	81.08
⅞	16.56	187.75	92.15	146.73	84.78
¾	17.33	178.50	83.95	138.40	83.88
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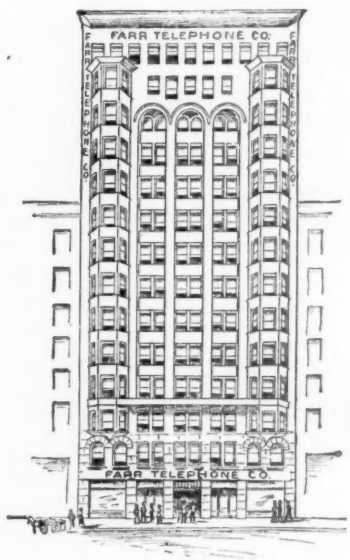

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INDEX OF ADVERTISERS.

A

	PAGE
Abendroth & Root Mfg. Co., boilers	xx
American Electrical Works, insulated wire	i
American Bell Telephone Co	xi
American Electric Telephone Co., long-distance telephones	xi
American Impulse-Wheel Co	xiv
Andrews-Ryan Co., telephone engineers	xvii
Armorite Interior Conduit Co	xviii
American Stoker Co	xvi

B

Babcock & Wilcox Co	xx
Bristol Co	i
Bunnell & Co., J. H., dry batteries	i
Baker & Co., platinum	vi
Ball & Wood Co., engines	xv
Barron & Co., James S	33
Berlin Iron Bridge Co	xi
Bogart Co., A. L	33
Brixey, W. R., Day's Kerite wires and cables	xiv
Buckeye Electric Co	ix
Bibber-White Co	vi

C

Clonbrock Steam Boiler Co	xx
Columbia Incandescent Lamp Co	i
Crefeld Electrical Works	i
Crocker-Wheeler Electric Co	i
Central Electric Co., electrical supplies	iii, iv
Chicago Edison Co	vi
Cutter Electrical Co., circuit-breakers	
Central Mfg. Co	

D

Day's Kerite, insulated wire	i, xiv
De Veau & Co	i
Diehl Manufacturing Co	iii
Dixon, Jos., Crucible Co., belt dressing	xv
Duval, E. S., Jr., patents	34

E

Electric Appliance Co., supplies	i
Eyanson & Armpriester	xv
Eastern Electric Cable Co	xvii
Electrical Exhibition Co	33
Empire China Works, porcelain specialties	xviii
Eppinger & Russell Co., Valentine subway electrical conduit	vi
Electric Storage Battery Co	iii
Eddy Electric Manufacturing Co	
Edison Decorative & Miniature Lamp Department	xiv
Edison, Thos. A., Jr	xiii

F

Fenton & Co	i
Fort Wayne Electric Corporation	xv
Frink, I. P	xx
Faraday Carbon Co., carbons	vi
Farr Telephone & Construction Supply Co.	x, xvii
Forest City Electric Works	xviii

G

Goldmark & Wallace, "Koch" dynamo brushes	i
General Electric Co	viii
Gordon-Burnham Battery Co	33
General Incandescent Arc Light Co	viii

H

Hart & Hegeman, electric switches	

I

Imperial Porcelain Works	xviii
India Rubber and Gutta Percha Insulating Co	xvii
International Correspondence Schools	33

J

Jandus Electric Co., arc lamps	

K.

	PAGE
Keystone Electrical Instrument Co	

L.

Leffel & Co., Jas	ix
Lombard Water-Wheel Governor Co	xx
Lehigh Valley Creosoting Co., creosoted lumber	xvii
Locke, Fred M	xviii
Lockwood Long-Distance Telephone & Telegraph Co. of America	vi
Lynn Incandescent Lamp Co	

M.

McKinlock & Camp	xiii
McKenney & Waterbury	i
Manhattan Electrical Supply Co	ix
Marshall, Wm., condensers	xi
McIntire Co., The C	
McLeod, Ward & Co	xv
Monarch Manufacturing Co	vii
Montauk Multiphase Cable Co	ix

N.

New York Insulated Wire Co., Grimshaw wires and cables	i
National Carbon Co	
National India Rubber Co	
Newton Appliance Co	
New York & Ohio Co	i
New England Engineering Co	x, xiii
New York Telephone Co	xi
Novelty Electric Co., supplies	xviii

O

Okonite Co., insulated wires and cables	i, ii, xx
Ostrander, W. R., & Co., supplies	34

P

Partrick, Carter & Wilkins	34
Paiste, H. T., Co	xv
Pennsylvania Electric Co., electrical supplies	xi
Phillips Insulated Wire Co., wire	xiv
Phœnix Glass Co	i

R

Ritchie & Sons, E. S	xvi
Roche, Wm., dry batteries	xv
Rodrigues, M. R	
Royce & Marean, electrical supplies	xvii
Reisinger, Hugo	xiv

S

Stirling Co., water-tube boilers	xx
Standard Underground Cable Co	
Sterling Co., C. B., electrical supplies	xx
Safety Insulated Wire & Cable Co	xv
Sipe & Sigler	
Solar Carbon & Manufacturing Co	xvii
Schiff, Jordan & Co	xiv
Stanley Electric & Manufacturing Co	viii
Sterling Supply & Manufacturing Co	xx
Swett & Lewis Co., X-ray machines	xvi
Stephenson Co., Ltd., John	
Stromberg-Carlson Telephone Mfg. Co	xvii
Sawyer-Man Electric Co	vi

V

Varley Duplex Magnet Co	i
Vulcan Foundry Co	xx
Viaduct Mfg. Co., telephones, etc	xi

W

Wanted	33
Western Electric Co	vi
Western Telephone Construction Co	xi
Westinghouse Electric & Mfg. Co	ix
White & Co., J. G., engineers and contractors	33

CLASSIFIED LIST OF ADVERTISERS IN THE "ELECTRICAL REVIEW."

Anti-Friction Metals.
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(See "Lamps.")

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Bunnell & Co., J. H.
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Barron & Co., Jas. S.

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Imperial Porcelain Works.
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Jandus Electric Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

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McLeod, Ward & Co.

Lamps, Incandescent.
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Edison Min. & Dec. Lamp Dept.
Lynn Incandescent Lamp Co.
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Westinghouse Electric & Mfg. Co.

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Frink, I. P.

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International Corresp. Schools.

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American Stoker Co.

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Western Telegraph Construction Co.

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Hart & Hegeman Mfg. Co.
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Paiste Co., H. T.

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American Elec. Telephone Co.
De Veau & Co.
Farr Telephone Construction & Supply Co.
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New York Telephone Co.
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Lombard Water-Wheel Gov. Co.

Water-Wheels.
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Leffel & Co., Jas.

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Brixey, W. R. (Kerite).
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Crefeld Electrical Works.
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Electric Appliance Co.
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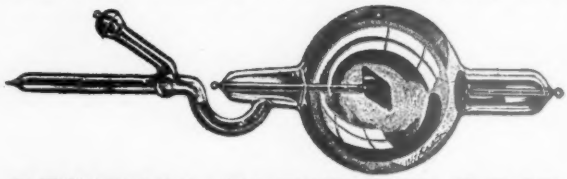

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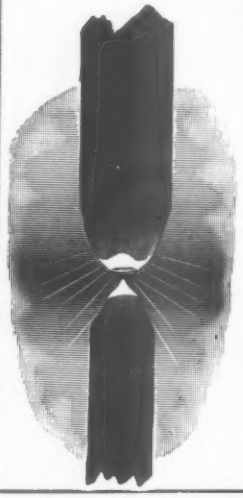

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